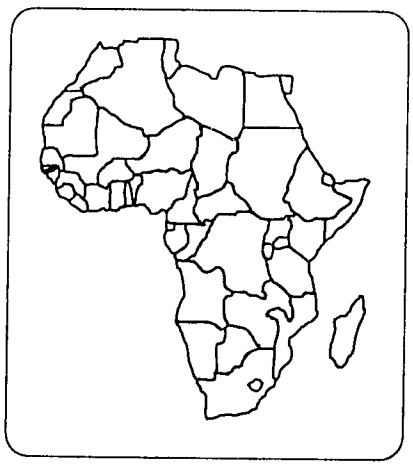
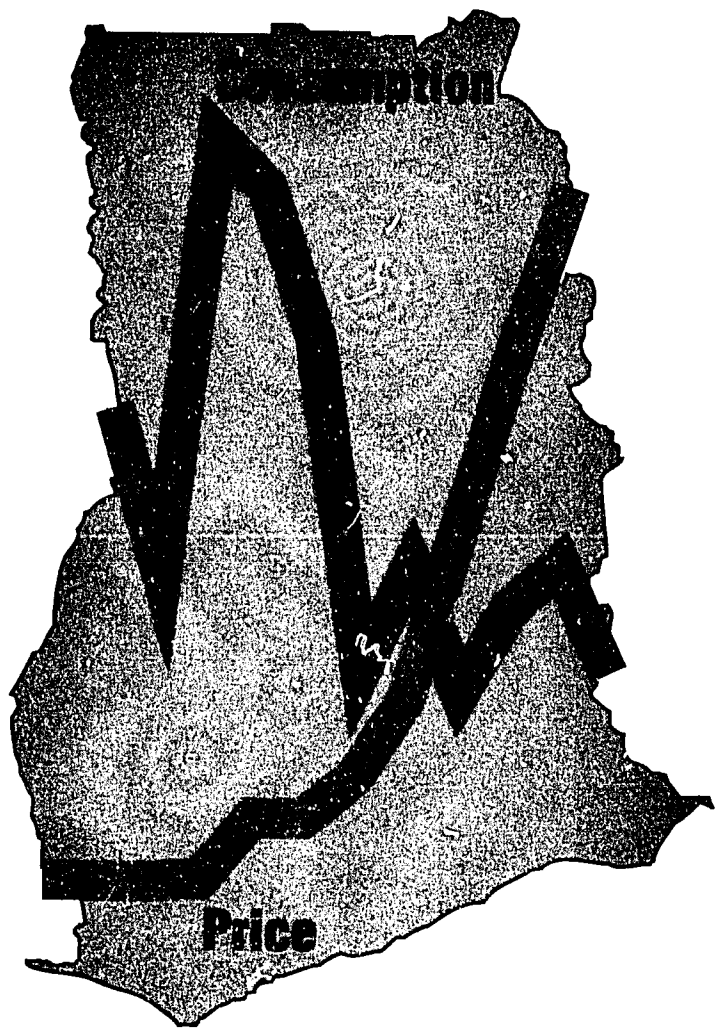
GHANA

Policy Environment and Fertilizer Sector Development





IFDC

International Fertilizer Development Center
and
Institute of Statistical, Social, and Economic Research

GHANA
Policy Environment and Fertilizer Sector Development

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Foreword

Ghana's population is projected to increase from 14.1 million in 1990 to 18.7 million in 2000. This growth in population along with growth in per capita income and urbanization will create increased demand for food, fiber, and raw materials and will therefore make intensive agriculture based on modern technologies, including fertilizers, indispensable. Furthermore, the shortening of fallow periods resulting from increased population pressures is contributing to resource degradation through nutrient mining. Both of these processes mandate that fertilizer use in Ghana be increased.

In contrast to the growing need, Ghana's fertilizer use levels are rather low. In 1990, Ghana used less than 5 kilograms per hectare of plant nutrients and replenished less than one-seventh of the plant nutrients removed by dominant crops. Such a negative balance in the nutrient account leads to the degradation of the resource base and food insecurity in the long run.

In order to understand the factors responsible for such low levels of fertilizer use and suggest measures for promoting efficient, equitable, and environmentally sound fertilizer use, the International Fertilizer Development Center (IFDC) and the Institute of Statistical, Social, and Economic Research (ISSER), in collaboration with the International Food Policy Research Institute (IFPRI), decided to initiate a comprehensive research project. Consequently, a fertilizer policy research group was established at ISSER to undertake fertilizer policy studies. Initially, the group decided to focus on the following broad themes:

1. Food security and fertilizer use.
2. Agronomic potential of fertilizer use.
3. Constraints on fertilizer use.
4. Policy environment and fertilizer sector development.

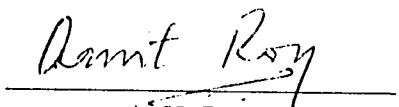
Studies under each theme focused on critical issues related to fertilizer use and supply in Ghana.

This study concentrated on issues related to the policy environment and its impact on the fertilizer sector operations in Ghana. The selected components of macroeconomic, microeconomic, sectoral, and organizational policies having a significant impact on the fertilizer sector operations were analyzed.

The study clearly brings out that a conducive and stable policy environment is essential for promoting growth in fertilizer use and thereby ensuring food security and environmental protection. A proper sequencing and phasing of policy reforms is also critical to achieve sustainable policy reforms and socioeconomic gains.

We hope that policymakers, researchers, and sector specialists in other African countries will benefit from the findings of this study. IFDC and ISSER will continue to undertake collaborative studies for analyzing and assessing the impact of various policy reforms and changes on food security, environmental protection, nutrient management, sustainable agriculture, and competitive market systems so that policymakers can formulate and implement socially desirable policies on a sound basis.

The funding for this collaborative effort was provided by the U.S. Agency for International Development (USAID), Washington D.C., under a grant to IFDC. We are grateful to USAID for its generous support.



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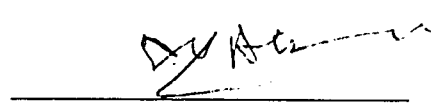

S. Y. Atsu
Acting Director
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Preface

It is now well known that growth in fertilizer use has played an important role in accelerating agricultural growth and ensuring food security in several developing countries. However, many countries in sub-Saharan Africa were unable to benefit from such transformation and therefore became increasingly food insecure over time.

In the mid-1980s, sub-Saharan Africa used about 8 kg/ha of fertilizer nutrients. This level was rather low compared with an average of 41 kg/ha in Latin America, 74 kg/ha in Asia, and 236 kg/ha in Western Europe. During the 1985-90 period, sub-Saharan Africa experienced little growth in its per hectare fertilizer use, whereas Asia's fertilizer use increased to over 100 kg/ha.

Declining per capita food production combined with low and stagnant fertilizer use encouraged IFDC and IFPRI to undertake a study on factors affecting fertilizer use in sub-Saharan Africa. Because IFDC's agronomic research had already shown that crop production in Africa was highly responsive to fertilizer use, this study was designed to focus on identifying policy-related constraints and suggesting measures to remove them. With funding from USAID, a project entitled Fertilizer Policy Research Program for Tropical Africa was initiated in 1987 and completed in 1992. As a part of that project, studies on the policy environment and fertilizer sector development in Ghana and Mali were completed.

In addition to providing funds for research, the project also supported institutional capacity building work in Ghana and Mali. Consequently, a fertilizer policy research group was established in each country. In Ghana, it was established at ISSER, University of Ghana, Legon, and in Mali, at the Institut d'Economie Rurale (IER), Bamako. The main objective of each group was to strengthen national capabilities in policy analysis, formulation, and implementation. The members of these groups worked collaboratively with IFDC and IFPRI staff members in completing various studies.

The present study is an outcome of the collaborative effort between IFDC and ISSER. A similar study for Mali is being prepared. Both studies identify policy-related constraints on the fertilizer sector operations in each country.

Although several people in Ghana contributed to the completion of this study, the support and cooperation of Dr. S. K. Dapaah, Chief Director, Ministry of Food and Agriculture, and Mr. E. Otinkorang, Crop Services Department, Ministry of Food and Agriculture, were indispensable. The funding support of USAID was equally indispensable. The encouragement of IFDC and ISSER management was noteworthy. The authors gratefully acknowledge the support received from various sources.

Abstract

Ghana's population is projected to increase from 14.1 million in 1990 to 18.7 million in 2000. This growth in population along with growth in per capita income and urbanization will create increased demand for food, fiber, and raw materials and will therefore make intensive agriculture based on modern technologies, including fertilizers, indispensable.

Ghana's Mid-Term Agricultural Development Programme stresses that Ghana's agricultural sector must grow by at least 4% per year to meet the increasing challenges of feeding and providing adequate nutrition for the growing population, creating employment, providing raw materials for industrial development, promoting regional development, and earning foreign exchange.

The achievement of 4% or more annual growth in agricultural output is possible provided new technologies are adopted and adequate physical, institutional, and human resources are developed. The technological transformation of Ghana's agriculture will need new technologies, practices, and methods of cultivation. Among such measures, fertilizer use will play a lead role. Increased fertilizer use will be required for adoption of improved crop technologies and replenishment of nutrients removed by crops under continuous cultivation.

In spite of the growing need for increased food production, Ghana's fertilizer use levels are rather low. In 1990, Ghana used less than 5 kilograms per hectare of plant nutrients and replenished less than one-seventh of the plant nutrients removed by dominant crops. Such a negative balance in the nutrient account leads to the degradation of the resource base and food insecurity in the long run.

To understand the factors responsible for such low levels of fertilizer use and suggest measures for promoting efficient, equitable, and environmentally sound fertilizer use, this study concentrated on issues related to the policy environment and its impact on the fertilizer sector operations in Ghana. It clearly brings out that a conducive and stable policy environment is essential for promoting growth in fertilizer use and thereby ensuring food security and environmental protection.

Macroeconomic policy has played an important role in constraining growth in fertilizer use. During the 1980s, rapid devaluation of the domestic currency resulted in over 25,000% increase in fertilizer prices. The removal of subsidies also contributed to this process. Consequently, fertilizer use decreased from 30,000 nutrient tons in 1980-82 to 10,000 nutrient tons in 1988-90. The privatization of fertilizer marketing, which was initiated in the late 1980s, was unsuccessful because the macroeconomic and price instability discouraged private dealers from participating in the fertilizer market. Lack of credit for farmers and fertilizer dealers also contributed to this outcome. The simultaneous introduction of exchange rate liberalization and subsidy removal programs does not promote growth in fertilizer use nor does it encourage private-sector participation. Proper sequencing and phasing should be developed for each policy, and, if needed, some safety nets should be provided to counteract the undesirable social impacts.

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Abbreviations, Acronyms, and Symbols

ADB	Agricultural Development Bank, Ghana
ADF	African Development Funds
AGDP	Agricultural gross domestic product
APPP	Agricultural Productivity Promotion Programme
AS	Ammonium sulfate
ASRP	Agricultural Services Rehabilitation Programme
¢	Cedis (Ghana's currency)
CAN	Calcium ammonium nitrate
CIDA	Canadian International Development Agency
CPI	Consumer price index
DAES	Department of Agricultural Extension Services
DAP	Diammonium phosphate
ERP	Economic Recovery Programme
EEC	European Economic Community
FAO	Food and Agriculture Organization of the United Nations
FASCOM	Farmers Services Company
FERTECON	Fertilizer Economic Studies, Ltd.
FLS	Frontline staff
GDP	Gross domestic product
GFDC	Ghana Food Distribution Corporation
GNP	Gross national product
GOG	Government of Ghana
IDA	International Development Agency
IER	Institut d'Economie Rurale
IFAD	International Fund for Agricultural Development
IFDC	International Fertilizer Development Center
IFPRI	International Food Policy Research Institute
IITA	International Institute for Tropical Agriculture
IMF	International Monetary Fund
ISNAR	International Service for National Agricultural Research
ISSER	Institute of Statistical, Social, and Economic Research
K_2O	Potash
MOA	Ministry of Agriculture
MOP	Muriate of potash
MTADP	Mid-Term Agricultural Development Programme
N	Nitrogen
NFDC	National Fertilizer Development Center
NPKs	Nutrients ($N + P_2O_5 + K_2O$) or complex fertilizers
P_2O_5	Phosphate
PCHHE	Per Capita Households Expenditure
PPMED	Policy Planning, Monitoring, and Evaluation Division
SCIMP	Smallholder Credit, Input, and Marketing Project
SOP	Sulphate of potash
SSP	Single superphosphate
TSP	Triple superphosphate
T & V	Training and visit
UNDP	United Nations Development Program
USAID	United States Agency for International Development
US $	United States dollars
VCR	Value-cost ratio

Chapter 1
Introduction

1.1 Rationale

Ghana's agricultural economy is in a state of developmental disequilibrium. It is moving from a stable-stationary equilibrium of low demand and low supply to an unstable disequilibrium of high demand and low supply of agricultural goods and services. Rapid growth in population coupled with urbanization and moderate increases in per capita income since 1970 has accelerated demand for agricultural goods and services. However, a distorted and unconducive policy environment, lower adoption of productivity-enhancing technologies, and inadequate development of physical and institutional infrastructure have constrained supply response to a low and insufficient level.

Furthermore, the traditional system of shifting cultivation is proving inadequate to meet the challenges of a growing population and economy. Without adequate and sustainable technological transformation, a move from shifting cultivation to continuous cultivation in densely populated areas is leading to the degradation of soils and other natural resources and productive capacity. This is mostly a result of the depletion of nutrients from soils resulting from the shortening of fallow periods.

Ghana's Mid-Term Agricultural Development Programme (MTADP) stresses that Ghana's agricultural sector must grow by at least 4% per annum to meet the increasing challenges of feeding and providing adequate nutrition for the growing population, creating employment, providing raw materials for industrial development, promoting regional development, and earning foreign exchange. This challenge has to be met against the background of less than 2% annual growth in the 1970s and about 2.8% annual growth during the 1984-90 period.

The MTADP also suggests that the achievement of 4% or more annual growth in agricultural output is possible provided new technologies are adopted and adequate physical, institutional, and human infrastructures are developed.

The technological transformation of Ghana's agriculture will need new technologies, practices, and methods of cultivation. Among such measures, fertilizer use will play a lead role. Increased fertilizer use will be required for adoption of improved crop technologies and replenishment of nutrients removed by crops under continuous cultivation.

Currently, Ghana's fertilizer use levels are rather low. In 1990 Ghana used less than 5 kg of plant nutrients per hectare of arable land as compared with 12 kg in Nigeria, 53 kg in Zimbabwe, 110 kg in Indonesia, and 366 kg in Egypt (Table 1.1). Ghana's total fertilizer use in 1990 was about 11,600 nutrient tons. This level of nutrient use replenished less than one-seventh of the nutrients removed by dominant crops (Table 1.2). Such a negative balance in the nutrient account leads to soil degradation and environmental damage in the long run. Furthermore, Ghana's fertilizer use decreased during the 1980s. If this trend is not reversed, Ghana may find itself in a precarious situation of irreversible environmental damage.

Table 1.1. Fertilizer Use in Selected Developing Countries, 1990

Country/Region	Fertilizer Use[a] (kg/ha)
Ghana	4.5
Mali	5.4
Ethiopia	7.0
Tanzania	9.3
Nigeria	12.1
Brazil	43.0
Kenya	48.1
Zimbabwe	52.9
India	68.7
Mexico	70.4
Bangladesh	97.6
Indonesia	110.4
Venezuela	137.6
China	264.6
Mauritius	290.0
Egypt	366.2
World	93.3

a. Kilograms of plant nutrients per hectare of arable land and land under permanent crops.

Source: Derived from data in FAO *Fertilizer Yearbook* and *Production Yearbook* (1990).

1.2 Objectives

Various studies have indicated that the policy environment plays an important role in promoting economic development and agricultural growth. A few studies also suggest that without the existence of a conducive policy environment, growth in fertilizer use is difficult, if not impossible. A conducive policy environment was the major force behind rapid growth in fertilizer use in many countries in Asia in the 1980s, whereas a nonconducive policy environment induced deceleration in growth in fertilizer

Table 1.2. Nutrient Depletion Estimates for Major Annual Crops, 1989

Crop	Production	Nutrients Removed		Total Nutrients Removed	
		N	P_2O_5	N	P_2O_5
	('000 tons)	(kg/ton)		('000 tons)	
Maize	550	50.0	20.0	27.5	11.0
Sorghum	370	30.0	12.5	11.1	4.6
Rice	120	15.0	7.5	1.8	0.9
Cassava	3,300	6.3	1.5	20.6	5.0
Yam	1,200	4.6	1.8	5.5	2.2
Cowpea	14	-	15.0	-	0.2
Groundnut	9	-	15.0	-	1.4
Total				66.5	23.3

Source: Ministry of Agriculture (1990).

use in Latin America and Africa (Bumb, 1989). Hence, this study's main objectives are as follows:

1. Analyze the evolution of the policy environment related to the fertilizer sector development in Ghana.
2. Assess the conduciveness of the policy environment.
3. Identify policy-related constraints and suggest measures to remove such constraints.

1.3 Nature and Scope

Although several policies and related components influence fertilizer use, supply, and prices, seven policies mentioned below have been selected for analysis and assessment of their impact on the fertilizer sector operations. These policies have been selected on the basis of theoretical and empirical evidence discussed in detail in Chapter 5; only selected components under each policy are analyzed. However, each policy and the related components are analyzed from the point of view of its impact on the fertilizer sector operations. The following policies were selected for an in-depth analysis and assessment:

1. Macroeconomic policy.
2. Pricing and subsidy policy.
3. Supply policy.
4. Organizational policy.
5. Credit policy.
6. Research and extension policy.
7. Environmental policy.

1.4 Data

The study is mostly based on the data for the 1970-90 period. In some cases, the paucity of data restricted the analysis to a shorter time span, whereas in others, the preliminary data were available for 1991. Hence the analysis was extended to cover the situation in 1991.

The data for the study have come from several sources including the Ministry of Agriculture, the Ministry of Finance and Planning, the Bank of Ghana, the Ghana Statistical Service in Ghana, and international organizations such as FAO, IFDC, and the World Bank.

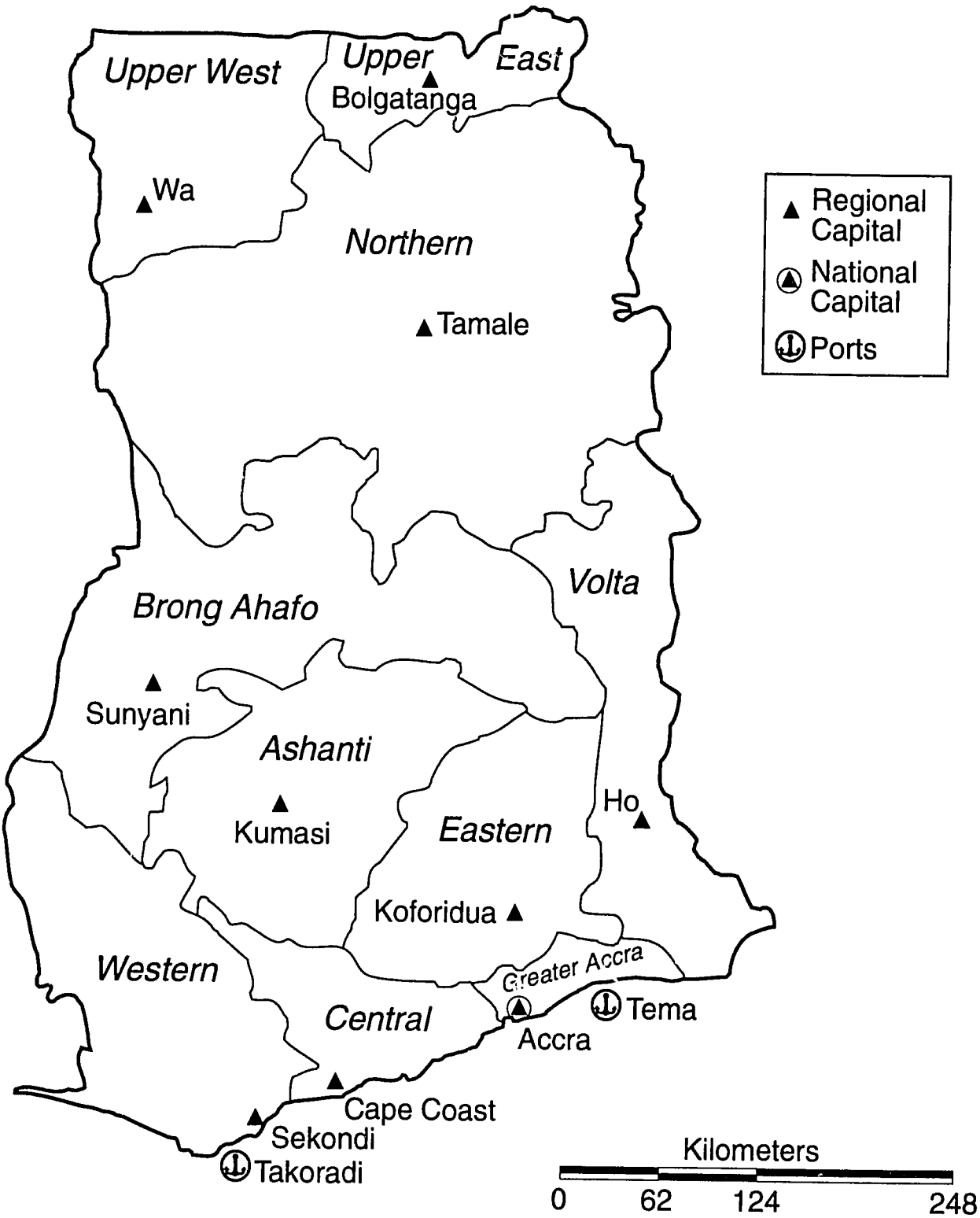
1.5 Regional Classification

Ghana is divided into 10 administrative regions (Map 1 and Table 1.3). Most of the regions in the south are relatively more advanced and have higher per capita incomes than their northern counterparts. Agroecologically, the regions in the south are covered mostly by rainforests, and

Table 1.3. Ghana: Population and Area by Region, 1990

Region	Population		Rural Population		Density	Area	
	('000)	% of Total	('000)	% Rural	(Persons/km²)	('000 km²)	(%)
Ashanti	2,525	17	1,717	68	104	24.4	10.2
Eastern	2,031	14	1,462	72	105	19.3	8.1
Greater Accra	1,729	12	294	17	534	3.2	1.4
Volta	1,464	10	1,171	80	71	20.6	8.6
Brong Ahafo	1,458	10	1,064	73	37	39.6	16.6
Northern	1,406	9	1,055	75	20	70.4	29.5
Western	1,399	9	1,077	77	59	23.9	10.0
Central	1,380	9	980	71	140	9.8	4.1
Upper West	529	4	471	89	29	18.5	7.8
Upper East	934	6	813	87	106	8.8	3.7
Total/Average	14,855	100	10,104	68	62	238.5	100.0

Source: Ministry of Agriculture (1991).



Map 1. Ghana: Administrative Regions

those in the north are savannahs. Climatic and agroecoiogic conditions divide the country into five zones, namely, rainforest, deciduous forest, transitional zone, coastal savannah, and northern savannah. The northern savannah is generally divided into Guinea savannah and Sudan savannah (Map 2). Each zone has specialized crop activities that affect fertilizer use in Ghana. In developing a viable fertilizer use strategy, adequate attention should be paid to zonal conditions.

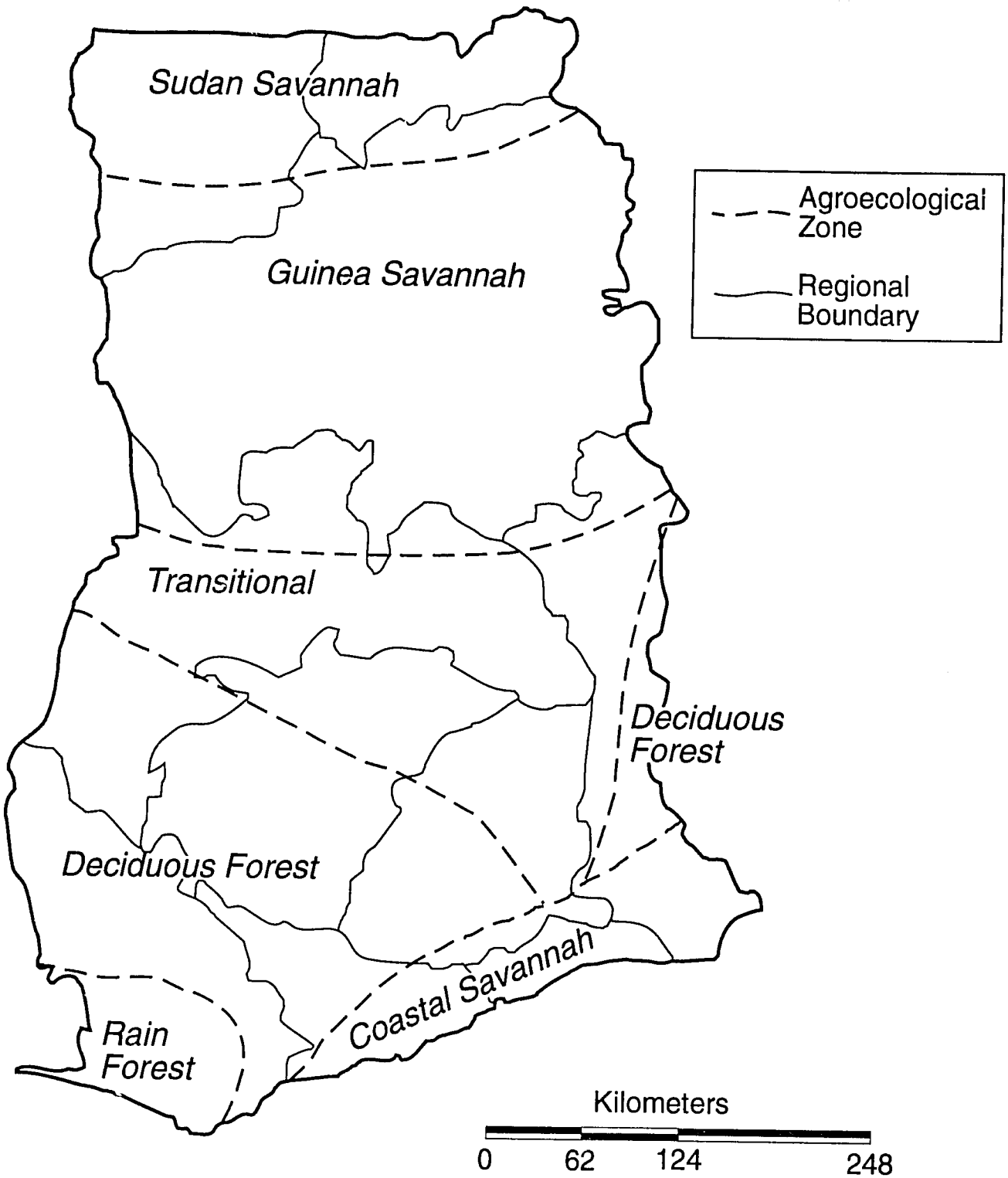
1.6 Outline of the Study

This introductory chapter of the study is followed by six additional chapters.

Chapter 2 provides the details on the selected macroeconomic indicators, and Chapter 3 discusses developments in the agricultural sector. These two chapters are intended to provide a broader context for the developments in the fertilizer sector, because many policies and developments in these two areas have direct and indirect impacts on the activities and operations in the fertilizer sector.

Chapter 4 provides an analysis of trends in fertilizer use, imports, prices, marketing and distribution, and other indicators in the sector. The analytical framework for evaluating various components of the policy environment is discussed in Chapter 5. The evolution of policy environment and the factors causing changes in the policy environment in Ghana are analyzed in Chapter 6. This chapter also provides an assessment of the policy environment. Specifically, it evaluates every policy from the point of view of its impact on the fertilizer sector operations.

The major findings and conclusions of the study are summarized in Chapter 7.



Map 2. Ghana: Agroecological Zones

Chapter 2
The Macroeconomic Setting

2.1 Introduction

Analysis of fertilizer sector development, like all sectoral analyses, is best done within the framework of the macroeconomic development for three important reasons. First, macroeconomic developments tend to influence the macroeconomic policy environment within which fertilizer sector development takes place. Second, the macroeconomic factors are capable of providing serious constraints on the supply and demand for fertilizer and, hence, on the use of fertilizer in the country. Third, developments in the macroeconomy often provide the rationale for the adoption of sector policies aimed at increasing agricultural productivity, which invariably leads to increased use of fertilizer.

The following are among the macroeconomic factors of interest:

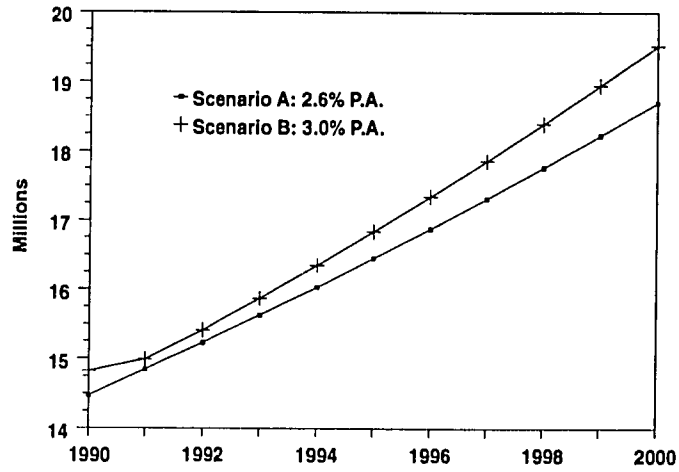
- Population (its rate of growth, projections, and age composition).
- The growth of macroeconomic aggregates such as the gross national product (GNP), gross domestic product (GDP), employment, inflation, and the standard of living.
- Exports, imports, balance of payments, exchange rate, and debt burden.
- The issues of poverty, hunger, and malnutrition.
- Macroeconomic policies such as fiscal, monetary/financial, trade, and payment policies.

2.2 Population Growth

The population of a country is the ultimate source of the demand for all goods and services and, as a result, is the ultimate determinant of the use of inputs in production necessary to meet the aggregate demand. It is also the source of a key input in production, i.e., labor. It is therefore vital to understand the nature of Ghana's population growth since it has implications for the demand for fertilizer.

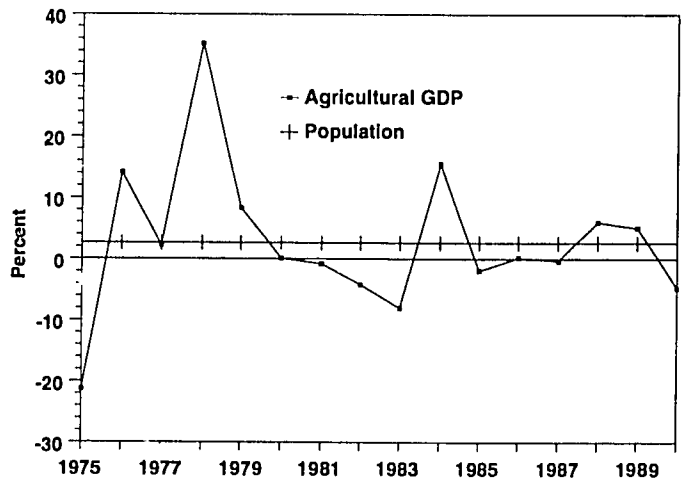
Ghana's population increased from 6.7 million in 1960 to 14.1 million in 1990 and is projected to reach 18.7 million in the year 2000. The projected population of 18.7 million is based on an annual growth of 2.6% between 1990 and 2000. Alternative estimates of the growth rate of 3% will raise the population of the country to 19.5 million in a decade. Figure 2.1 illustrates the two alternative population growth scenarios.

Whereas the consequences of rapid population growth are well known and need not be repeated here, it is important to reiterate its implication for increased demand for food. Figure 2.2 indicates that food production has not been able to keep up with rate of population growth. Even during



Source: Ghana Statistical Service.

Figure 2.1. Ghana: Population Growth Projections, 1990-2000.



Source: Ghana Statistical Service and Ministry of Agriculture.

Figure 2.2. Ghana: Annual Growth in Population and Agricultural GDP, 1975-90.

1984-90, when overall economic growth was impressive, the rate of agricultural growth, defined narrowly to exclude cocoa produce marketing, forestry, and logging and fishing, was only 2.8% per annum compared with population growth rate of 2.6% per annum.

The age distribution of Ghana's population is skewed in favor of the very young. The Ghana Statistical Service estimates that 47.2% of the population of Ghana in 1986 was under 15 years, while as much as 35.6% was less than 10 years of age (World Bank, 1991, p. 88). Such a youthful population, coupled with high rural-urban migration,[1] has

1. Ghana's urban population increased from 23% of the total population in 1960 to 32% in 1990.

given rise to population pressures not only on the demand for food, but also on food production, owing to the dwindling labor force available to the farming sector.

Given the situation of increasing demand for food in the face of a decreasing agricultural labor force, a plausible intervention is increased application of fertilizer aimed at raising agricultural productivity, in order to keep the per capita consumption of domestically produced food at the same level. Increased use of fertilizer is even more crucial in view of other factors, such as the impact of intensive farming practices and shortening of fallow periods on soil fertility.

2.3 Economic Performance

The Ghanaian economy has gone through strains and stresses over the past three decades, recording its worst performance during the decade prior to 1984, and recovering after the introduction of the Economic Recovery Programme (ERP) in April 1983. Two indicators that have been used to assess the performance of the economy during the ERP era are the rate of growth of the national income and the rate of inflation. Whereas the rate of inflation, as measured by the rate of growth of the consumer price index (CPI), may be said to be a fairly good measure of the cost of living of Ghanaians, the rate of growth of national income measures the rate of flow of goods and services in the country and therefore does not measure the extent to which the average Ghanaian is becoming better or worse off. An improved measure of the standard of living of the average Ghanaian, albeit still far from perfect, is the real national income per person. Table 2.1 gives a summary of these and other macroeconomic indicators that form the basis of our analysis.

2.3.1 Economic Recovery Programme–The economic problems of the 1970s and early 1980s have been summarized by Okyere (1986) as declining real output, continued budget deficits, rapid monetary expansion, high domestic inflation rates, persistent balance of payment deficits, overvaluation of domestic currency, a flourishing parallel market in foreign currency, and loss of domestic goods and government revenue through smuggling.

To resuscitate the economy, the government launched a set of reforms under an ERP. The first part of the ERP, which was a stabilization policy, sought to create incentives to stimulate the productive sectors of the economy by realigning relative prices (including exchange rate and interest rate) in favor of domestic production of import substitutes and exports, and by providing needed supplies through an import liberalization program. The strategy was also aimed at improving government finance and encouraging private investment.

Table 2.1. Macroeconomic Indicators

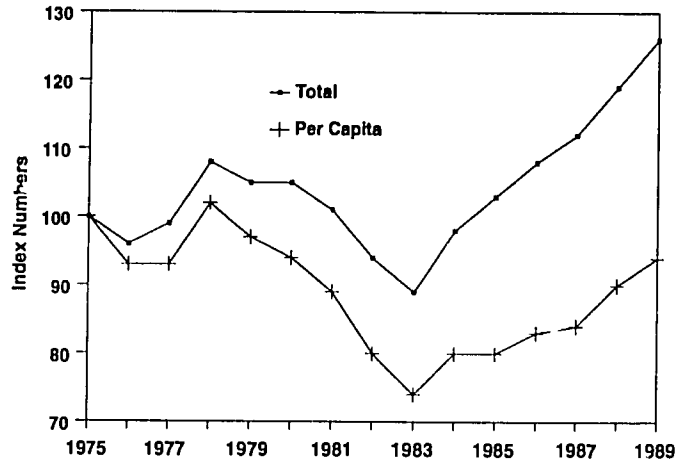
Year	Real National Income (million ¢)	Per Capita Real National Income (¢)	Consumer Price Index (numbers)	Rate of Inflation (%)
1975	4,918	493	29.0	-
1976	4,718	460	45.9	58.3
1977	4,850	459	100.0	117.9
1978	5,321	504	173.1	73.1
1979	5,183	479	267.3	54.4
1980	5,171	466	401.2	50.1
1981	4,986	438	868.6	116.5
1982	4,607	394	1,062.4	122.8
1983	4,388	366	2,367.4	122.8
1984	4,842	394	3,304.2	39.6
1985	5,046	397	3,647.2	10.4
1986	5,307	407	4,543.1	24.6
1987	5,511	412	6,352.0	39.8
1988	5,848	446	8,343.9	31.4
1989	6,186	464	10,449.3	25.2

Source: World Bank (1987 and 1991).

After achieving some successes in the first 2 years in terms of economic growth and a reduction in inflation and budget deficits, the government launched a medium-term program which was aimed at removing structural impediments from the economy and putting it on a growth path. The economy has responded positively to the policies pursued. There have been increases in the traditional exports of cocoa, minerals, and timber. The number and value of nontraditional export commodities have increased. Although there has been some improvement, the local manufacturing industry has not responded as buoyantly as the export sector because of competition resulting from trade liberalization and a credit squeeze instituted to control inflation.

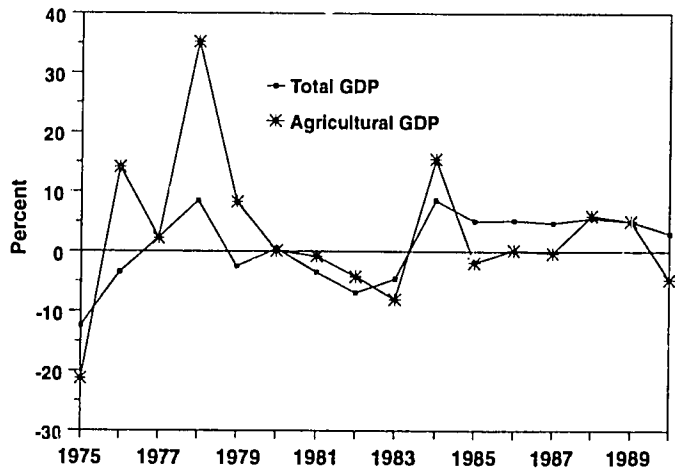
2.3.2 Growth of Real Income and Income Per Person–After over a decade of stagnation, the Ghanaian economy began to register positive growth rates in 1984. Since then, the real national income of the country has grown at an annual rate of 5.3% compared to a decline of 1.1% per annum during the preceding period of 1977-83. It will be noted, however, that the economy recorded its worst decline during the 3 years immediately preceding 1984. During that period, the real national income fell by 5.3% each year. In terms of per capita income, the performance of the economy prior to 1984 is even more dismal, registering an annual average decline of real national income per person of 2.9%, whereas during 1984-89 it grew at the rate of 4.1% per annum. Once again, it is interesting to note the precipitous fall in the real national income per person during the period 1981-83–a growth performance worse than that of any other period in the history of the country. The real national income per person during this period fell at an annual rate of 7.8%.

In spite of good performance of the economy since 1984, the index of per capita real income, which measures the standard of living of the Ghanaian, was below the 1979 level (Figure 2.3). Also, the social costs of adjustment, in spite of attempts to mitigate them, still persist while the social dimensions of adjustment have not yet been fully integrated into macroeconomic policies. Furthermore, and perhaps more relevant to fertilizer analysis, is the consideration that during this 6-year period (1984-89) growth in the agricultural sector lagged behind that in the rest of the economy, as Figure 2.4 indicates. During this period, agricultural GDP grew annually at 2.8%, just enough to offset the estimated rate of population growth of 2.6%. Agriculture is heavily dependent on climatic factors, which may account for the unsatisfactory performance of the sector. However, it is for this very reason that improved technology, which has fertilizer application as a vital component, becomes a plausible solution to the slow growth in the agricultural sector.



Source: World Bank (1987 and 1991).

Figure 2.3. Ghana: Index of Real National Income–Total and Per Capita, 1975-89 (1975=100).

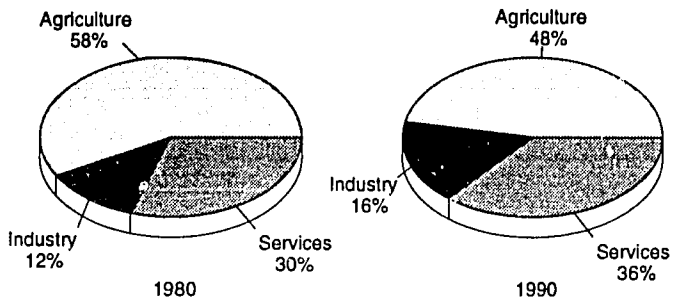


Source: World Bank (1987 and 1991).

Figure 2.4. Ghana: Annual Growth in Real Gross Domestic Product (GDP)–Total and Agricultural, 1975-90.

The slower growth of the agricultural sector has caused the share of the sector in real gross domestic product to decline from 58% in 1980 to 48% in 1990 (Figure 2.5). Whereas the sector's declining share in domestic production is one of the stylized facts of economic growth, it is also true that a strong and sustained growth in the agricultural sector forms a solid foundation for industrial and economic development of the country.

2.3.3 Inflation–The Ghanaian economy has passed through regimes of administered prices (pre-1984) and price liberalization (post-1984). Price controls failed to curb inflation because the policy did not address the underlying causes of inflation. Hence, during the period 1978-83, inflation averaged an annual rate of 73.2%. Several factors contributed to the spiraling inflation of the late 1970s and the early 1980s, including increased money supply, budget

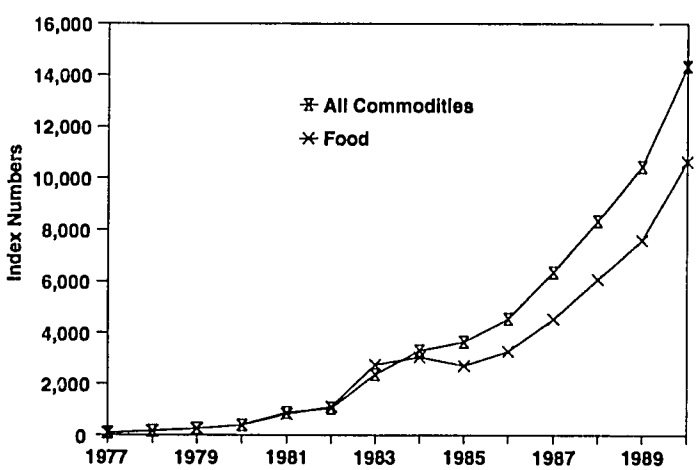


Source: *Quarterly Digest of Statistics*, various issues.

Figure 2.5. Ghana: Gross Domestic Product by Economic Activity, 1980 and 1990.

and balance of payment deficits, declining agricultural and industrial output, and growing foreign debt. After 1983, however, inflation fell to about 30%, less than half of the annual inflation of the preceding 6 years.

The contribution of food prices to price formation in the country (as illustrated in Figure 2.6) perhaps gives the best illustration of the role that agriculture plays in the national economy. Given the 49.2% weight in the national consumer basket (49.8% for households in rural areas), what happens to food prices substantially and directly affects the cost of living of Ghanaians. Indirect but potent effects are evident in the impact of the price of agricultural-based inputs on manufacturing and the export earnings from agriculture, which constitute an important source of foreign exchange to pay for imports necessary to compensate for the shortfall in the domestic supply of consumer goods. In Ghana, therefore, the dependence of price stability on the increased agricultural production and agricultural prices cannot be overemphasized.



Source: Ghana Statistical Service.

Figure 2.6. Ghana: Consumer Price Index–All Commodities and Food, 1977-90 (1977=100).

2.3.4 Employment, Earnings, and Standard of Living–Data on employment in Ghana are limited. Apart from employment figures obtained from census years, the only indicator of the employment trend in the country is the employment reported by certain establishments. According to the 1970 population census, 6% of the labor force was unemployed during 1970. Contrary to what the poor economic performance during the period prior to 1984 would suggest, the unemployment rate had improved remarkably in 1984. The 1984 population census results indicate that 2% of the labor force in 1984 was unemployed. It is difficult to interpret these results without being clear about the definition of unemployment used in the two population censuses. It is possible that many of these workers are underemployed.

According to a recent report (UNDP, 1991, p. 151), the labor force of Ghana in 1988/89 was 38.1% of the total population. This may be compared to a labor force participation rate of 43.9% for developing countries and 38.8% for sub-Saharan Africa. It was also reported that women constituted 40% of the labor force during this period, indicating a higher labor force participation rate for women in Ghana than for most of sub-Saharan Africa and, indeed, the rest of the world.

Also data in the report indicate that, over the years, the labor force composition has gradually shifted away from agriculture. During the period 1985-88, 49.3% of the labor force was in agriculture compared with 61% reported for 1965. On the other hand, there has been substantial decline in the share of industry in the labor force, from 15% in 1965 to 11.1% in 1985-88, a situation confirming the industrial decay that has characterized the Ghanaian economy since 1970. The last sector, the service sector, has gained from the two sources of decline in the labor force participation rates (i.e., agriculture and industry). Consequently, greater and greater proportions of the labor force have moved into the service sector, the share increasing from 24% in 1965 to 29.6% in 1985-88. To the extent that employment in the government sector has been increasing slowly, if at all, one can infer that the majority of the shift in the labor force to the service sector went into the private sector. Following the analysis by Ninsin (1990), therefore, it can be concluded that the informal subsector of the service sector has tended to absorb most of the surplus labor force from the other two sectors.

In the final analysis, however, the labor force composition of the country confirms that Ghana is still a predominantly agricultural economy, and hence policy analysis cannot ignore the role of this sector; that makes fertilizer policy analysis also important to development policy analysis in the country.

2.4 Poverty, Hunger, and Malnutrition

As noted earlier, the real income of the average Ghanaian in 1989 was below what prevailed in either 1975 or 1979, and it was equal to that of 1980. During 1975-83, the real income per person in Ghana declined consistently. Indeed, the average earnings of workers declined further from an index of 100 in 1977 to 21.9 in 1983. However, since 1984 the plight of the worker has shown a remarkable improvement, with the index rising to 76.7 in 1988. However, despite these improvements, in 1990, 6.6 million people were estimated to be below the poverty line with 56% living in the rural areas (UNDP, 1991).

In a recent study based on the Ghana Living Standard Survey, Oti Boateng et al. (1990) used an average expenditure of ¢32,981 per family as a basis of the poverty line. They also defined hard-core poverty as consisting of expenditures below ¢16,491 (in 1988 prices). According to these norms, 36% of Ghana's total population and 44% of the rural population were below the poverty line in 1987-88 (Table 2.2). In the same year, 7.4% of the Ghanaians lived under hard-core poverty, whereas in rural areas this proportion was 9.5%. Of all the poor, about 79% were concentrated in rural areas.

From the point of view of agriculture and perhaps fertilizer use, the poverty profile by locality, which has implications for ecological zones, may be more relevant. In this connection, Table 2.3 is of greater interest. Locations where more than 50% of the people live in households with incomes that fall below the poverty line are Mid-Coastal, Volta basin, and the savannah areas, in ascending order. The next

Table 2.2. Ghana: Rural-Urban Poverty, 1988

Area	Population Share (%)	Mean PCHHE[a] (¢)	Population Below Poverty Line (%)	Contribution to National Poverty (%)
Rural	64.95	43,043.8	43.9	79.3
Urban (excluding Accra)	26.76	52,975.7	26.5	19.8
Accra	8.29	88,527.6	4.0	0.9
All Ghana	100.00	49,471.5	35.9	100.0

a. PCHHE is Per Capita Households Expenditure, which proxies level of income.

Source: Oti Boateng et al. (1990).

Table 2.3. Ghana: Poverty by Locality, 1988

Locality	Population Share (%)	Mean PCHHE[a] (¢)	Population Below Poverty Line (%)	Contribution to National Povery (%)
Accra Metropolis	8.2	87,618.5	5.5	1.3
Mid Coast	8.8	40,414.1	51.2	12.5
West Coast	9.9	61,336.3	16.2	4.5
East Coast	9.1	60,790.7	20.6	5.2
East Forest	10.6	55,778.1	19.9	5.9
Mid Forest	9.1	40,541.1	47.3	11.9
West Forest	11.8	42,608.5	40.8	13.4
Upper Forest	9.0	43,242.6	39.8	10.0
Volta Basin	11.6	37,964.1	52.3	16.8
Savanna	11.8	35,009.4	55.9	18.4
All Ghana	100.0	49,471.5	35.9	100.0

a. PCHHE is Per Capita Households Expenditure, which proxies level of income.

Source: Oti Boateng et al. (1990).

group of localities consists of Mid-Forest, West Forest, and Upper Forest areas, where 39.8% to 47.3% of the people live in households with incomes below the poverty line. Apart from Accra, the localities with low percentages below the poverty line are East Coast (20.6%), East Forest (19.9%), and West Coast (16.2%).

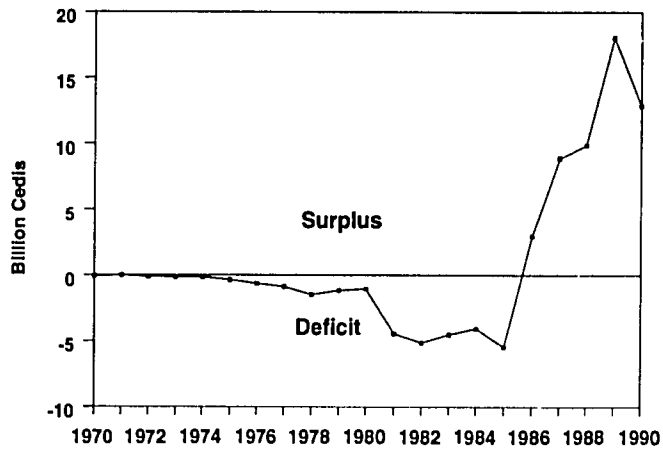
Poverty is normally associated with hunger and malnutrition. In 1984-86 it was estimated that Ghanaians obtained only 76% of their daily calorie requirements. This situation is unsatisfactory to the extent that it is below the percentage for sub-Saharan Africa (91%) and is also below that of the least-developed countries (89%) (UNDP, 1991, p. 123).

2.5 Fiscal Development

The relationship between the fiscal actions of the government and the rest of the economy originates from a number of factors:

1. Government expenditures, being a component of aggregate demand, have the capacity of having a multiplier effect on the economy, and they also affect the level of investment.
2. Government tax and subsidy policies are potent means affecting not only the size of gross national income but also its distribution.
3. The difference between government revenue and expenditure can accelerate or slow the real side of the economy.
4. Either directly or through its impact on the money supply, fiscal balance is an important tool for stabilizing the economy.
5. At the sectoral level, the provision of social and economic infrastructure is the most potent mechanism for achieving social welfare, addressing noneconomic issues such as pollution, and achieving spatial balance in the allocation of goods, services, and opportunities.

Figure 2.7 summarizes the fiscal performance of the country from the 1969/70 fiscal year to 1990. As the figure vividly brings out, until 1986 the government expenditures always exceeded total government revenue. The fiscal deficit, which stood at ¢89 million in 1969/70 and ¢357 million in the 1974/75 financial year, increased over the years to reach an astronomical figure of ¢5.5 billion in 1985. However, prudent fiscal measures, including those that increased revenue and controlled expenditures, brought about the turnaround in 1986. A key factor in the recovery of government revenue was liberalization of prices including the exchange rate. Hence, although government expenditure increased, the government revenue increased even faster during the 1986-90 period, leading to a budget surplus of about ¢12.8 billion in 1990. Although the 1990 government expenditure was 226 times the level in 1974/75, government revenue had increased by 332 times during the same period creating a budget surplus in 1990.



Source: *Quarterly Digest of Statistics*, various issues.

Note: Before 1982, data refer to split years, e.g., 1969-70, indicated by 1970. Thereafter, data refer to calendar years.

Figure 2.7. Ghana: Government Fiscal Balance, 1970-90.

The policy of government expenditure rationalization, which has been taking place in the country since 1983, has implications for fertilizer use. In the first place, there is the indirect effect of this policy through the reduction in the supply of cooperant factors such as the level of agricultural extension, irrigation, and mechanization; these factors may adversely affect fertilizer use in the short run. More directly the policy has resulted in the withdrawal of fertilizer subsidies and privatization of fertilizer marketing, measures which in the short run at least are likely to constrain fertilizer use. These sectoral issues arising from macroeconomic policies are so crucial to fertilizer policy analysis that we analyze them more fully in Chapter 6.

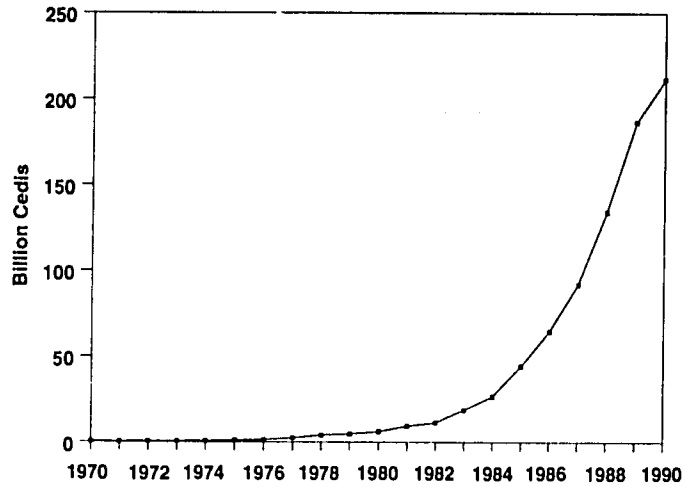
2.6 Monetary and Financial Developments

Without entering into the debate of whether money is productive and/or the household derives utility from holding money either in the short run or in the long run, it must be stressed that the monetary and fiscal developments in the country have conditioned the macroeconomic landscape of the economy. The single variable most responsible for the movements in the general price level is the money supply. Also, from the point of view of growth, the volume and composition of credits given by financial institutions to both the private and public sectors have dictated the direction of investment in the country.

At the sectoral level, the lack of sufficient credit to the agricultural sector has influenced the development in the sector and hence the supply and demand for fertilizer.

Figure 2.8 shows the trend in money supply during the 1970-90 period.[2] It is clear from the figure that money supply has

2. Money supply consists of currency *plus* demand deposits.

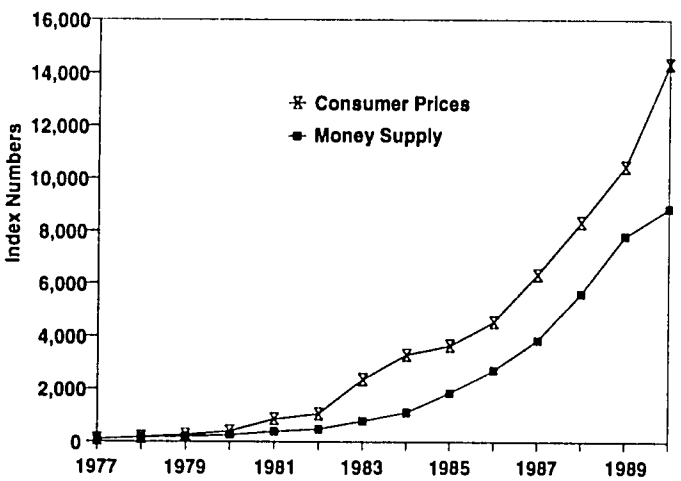


Source: The Bank of Ghana, Accra, and *Quarterly Digest of Statistics* (various issues).

Figure 2.8. Ghana: Money Supply, 1970-90.

been increasing very rapidly over the years, especially during the 1984-90 period.

Regarding the consequences of monetary growth for inflation, Figure 2.9 shows the close relationship between money supply and the consumer price index. The implication is that if the objective of the monetary policy pursued is price stabilization, then the policymakers should control money supply.



Source: The Bank of Ghana and Ghana Statistical Service.

Figure 2.9. Ghana: Index Numbers of Money Supply and Consumer Prices, 1977-90 (1977=100).

2.7 International Trade and Payments

2.7.1 Exchange Rate Reforms–As part of the ERP, the government in April 1983 initiated steps to realign the domestic currency to its true value or towards a market-determined rate. At the beginning, a system of bonuses and surcharges was introduced depending upon whether a commodity was being exported or imported. Due to its cumbersome nature, the system was abolished on September 19, 1986, and a two-tier official market for foreign exchange was introduced. One tier covered cocoa and petroleum transactions, imports of essential drugs, and government debt service payments; the second tier covered all other transactions.

On February 20, 1987, the two-tier official market was abolished and an auction introduced for all official transactions in foreign exchange. The foreign exchange rate was established by the marginal exchange rate determined by a weekly auction.

In order to encourage the flow of additional resources through legal channels and to improve the operation of the exchange system, the government permitted the establishment of foreign exchange (Forex) bureaus, which are licensed by the Bank of Ghana and are subject to certain rules and regulations. The auction was abolished in 1992, and commercial banks were allowed to purchase foreign currency from the Bank of Ghana and sell it to their customers. The cedi thus became completely floating as rates were quoted on a daily basis.

2.7.2 Balance of Payments Situation–The trade and payments position of Ghana is summarized in the balance of payments account, given for the period 1980-90 in Table 2.4. The table indicates that the balance of trade, which was positive in 1980, turned negative throughout the period 1981-90, except in 1982 when there was a balance of trade surplus of $10 million.

As the behavior of current account item "net private transfer" shows, since 1983 the value of foreign exchange transferred by the private sector into the country has exceeded the corresponding transfer outside the country. This positive development in the balance of payments is in response to the exchange rate liberalization policy and the restructuring of the banking system, which has permitted the operation of foreign accounts in Ghana by citizen and noncitizen residents alike. Net private transfer has, however, not been able to offset the huge deficits in the rest of the current account, and consequently the deficits in the current account persisted throughout the period 1980-90.

The deficits in the current account balance have been financed by a combination of sources including grants, official long-term and short-term loans, direct foreign investment, and International Monetary Fund (IMF) financing arrangements. The overall balance (that is the balance to be financed by drawing on reserves if the balance is negative, or added to reserves if the balance is positive) was positive for all the years with the exception of 1981, 1983, 1985, and 1986. This means that for most of the years since 1980 Ghana was able to build up its reserves. This trend was more pronounced during the period 1987-90. If such a reserve buildup is a measure of the strength of the economy, it is debatable whether a country classified as poor can

Table 2.4. Ghana: Balance of Payments, 1980-90

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
	(million US $)										
Exports (f.o.b.)	1,104	711	641	439	567	632	749	827	879	804	826
Imports (c.i.f.)	-972	-1,021	-631	-539	-681	-729	-805	-1,028	-1,063	-1,098	-1,300
A. Balance of trade	132	-310	10	-100	-114	-96	-56	-201	-184	-292	-474
B. Nonfactor services	-104	-113	-85	-65	-91	-90	-115	-95	110	-99	-87
C. Net factor income	-80	-81	-82	-82	-81	-110	-106	-126	-131	-144	-108
D. Private transfers	-3	-4	-1	17	73	33	73	202	172	202	202
E. Current account balance (A + B + C + D)	-55	-508	-158	-230	-214	-264	-204	-221	-252	-306	-467
F. Capital account balance	67	258	185	-13	251	146	147	359	377	434	557
G. Overall balance (E + F)	12	-250	27	-243	37	-118	-57	138	125	128	90

Source: World Bank (1987 and 1991).

afford the luxury of adding to its reserves, considering that the opportunity cost for such a reserve buildup is the return that would have been generated if the amount had been invested in the domestic economy.

Export growth rates contained in Table 2.5 provide the basis for a closer look at the behavior of Ghana's exports. High growth rates were recorded in 1986-88 for timber, nontraditional exports, bauxite, gold, electricity, and nonfactor services in descending order. Cocoa export earnings grew by only 2.4%, but had a remarkable recovery in 1988-90, when they grew by 12.5%. The value of timber exports, however, fell in the second period. Diamonds, which registered a negative growth rate in 1986-88, rebounded sharply during 1988-90 when exports grew by 43.3%; gold improved its growth record to 18% per annum during this period. On the other hand, earnings from nontraditional exports and manganese fell. Although the growth of earnings fell for more than half of the export items in Table 2.5, the total export earnings of the country grew at 8.9% during 1988-90 compared with the 7.8% growth rate recorded for 1986-88. This is due to the strong impetus given by traditional exports such as cocoa, gold, and diamonds.

The World Bank has projected conservative rates of growth for traditional exports and expects nontraditional

Table 2.5. Ghana: Annual Growth in Exports, 1986-2000 (Constant 1984 Cedis)

	1986-88	1988-90	1990-95[a]	1995-2000[a]
	(%)			
Cocoa	2.4	12.5	1.3	1.9
Timber	37.3	-17.7	2.1	1.3
Gold	14.5	18.0	18.4	5.3
Diamond	-26.4	43.3	7.0	3.7
Manganese	7.2	-4.9	1.5	1.5
Oil Residual	0.9	-2.5	0.0	0.0
Electricity	10.4	6.7	0.3	0.5
Bauxite	15.1	10.9	1.6	1.4
Nontraditionals	29.7	-5.3	14.0	16.4
Nonfactor Services	7.5	5.4	8.8	11.2
Total Exports	7.8	8.9	5.9	4.2

a. Projections.
Source: World Bank (1991).

exports and nonfactor incomes to fill in the slot in order for total exports to grow at a respectable rate of 5.9% during 1990-95 and 4.2% in 1995-2000. The basis for these projections is the diversification policy, which is expected to enable nontraditional exports to grow at the rate of over 15% during the next decade. Also, nonfactor services are expected to grow at an average of 10% during the 10-year period. To the extent that a major source of nontraditional exports is from the agricultural sector, the implications of these forecasts for fertilizer use are obvious.

Projections of export earnings are conditioned upon the assumption that the country's terms of trade will improve. The terms of trade picture is not all that clear. The World Bank (1991, p. 53) has projected that the country's terms of trade will improve by 10% during 1990-93 and 5% during 1994-2000. However, to the extent that by 1993 the country's terms of trade would still be worse than the level in 1986/87 by as much as 25%, the balance of payments can improve further only through increases in the volume of exports.

Whereas import volumes have lagged behind the economy during the past decade, imports are expected to grow in line with the economy in the next decade. Hence, on the supply side also, the forecasts support a positive development in the fertilizer industry.

2.7.3 Debt Situation–It is important to analyze the debt situation for two major reasons. First, an increase in the level of domestic debt indicates that the government is spending beyond its means. On the other hand, the accumulation of foreign debt implies that the country cannot generate sufficient surplus in its balance of payments to fill the gap between budgetary deficits and private investment on the one hand and private savings on the other. The second reason is that, depending on the structure of the new debt, debt accumulation has the potential of fueling inflation and restricting imports of raw materials and technical know-how needed for agricultural and industrial development.

Table 2.6 gives data on how the country has serviced its external debt since 1985 and projections for 1991-93. Total debt service, i.e., amortization and interest payments, fell from $314 million in 1985 to $206 million in 1990, and is expected to decrease to $187 million in 1993. Ghana is expected, however, to be in a stronger position to make these payments, owing to strong growth projected for exports of goods and nonfactor services from $948 million in 1990 to $1,326 million in 1993. Hence, the debt service ratio (as it is defined in the table), which has been falling during the period 1987-90, is expected to continue its decline during the 1991-93 period.

Table 2.6. Ghana: External Debt Service on Government and Government-Guaranteed Debt

Item	Actual					Preliminary	Projected		
	1985	1986	1987	1988	1989	1990	1991	1992	1993
	(million US $)								
Medium- and Long-Term Debt									
Amortization	255	262	194	222	186	139	123	119	112
Interest	59	45	67	74	65	67	71	74	75
Total Debt Service	314	307	261	296	251	206	194	193	187
IMF Obligations									
Repurchases	0	22	174	264	175	113	81	65	68
Charges	44	54	52	48	42	36	33	25	19
Total IMF Debt Service	44	76	226	312	217	149	114	90	87
Grand Total	358	384	488	608	467	354	306	284	273
Debt Service Ratios (%)									
Excluding IMF	47	38	29	31	28	22	18	16	14
Including IMF	53	48	54	63	53	37	29	24	21
Memorandum Item									
Export of Goods and Services	672	797	904	961	886	948	1,044	1,198	1,326

Source: The Bank of Ghana (1985-88) and World Bank Staff estimates (1989-93).

Note: Totals may not add due to rounding.

Chapter 3
Performance and Prospects of Agriculture

3.1 Contribution of Agriculture

The agricultural sector in Ghana plays an important role in the national economy. The sector employs 60% of the population, contributes 53% to the GDP, and provides 75% of merchandise exports.

During the colonial era, emphasis was placed on the production of export crops without any deliberate attempts to develop the food crop subsector. As a result, cocoa production increased and Ghana became the largest producer in the world. After independence, Ghana embarked on a developmental policy that was geared towards rapid industrialization and large-scale agricultural production with massive participation by the state. Agriculture was heavily taxed to finance investments in industry and infrastructure. Less than 30% of the international price was paid to cocoa producers and other farmers. As a result, agricultural producer incentives worsened. For example, cocoa farmers in 1983 received in real terms 21% of the producer price they received in 1970; cotton farmers in 1982 received 9% of 1970 prices; and tobacco farmers in 1984 received 38% of the 1970 prices. With the reduced incentive to produce, agricultural production declined. In 1983 cotton production was 25% of its average in 1975-77, tobacco production was 20% of its average level in 1974/75, and cocoa production was 45% of its average annual volume in 1974-76. Output of food and cash crops declined at a rate of 0.3%/year between 1970 and 1980. Cereal production, which exceeded domestic demand by some 200,000 tons in 1971-73, registered a deficit of over 300,000 tons in 1981-83. Production of starchy staples fell from 7.9 million tons to 4.1 million tons between 1974 and 1981. As a result of declining food output combined with a rising population, per capita food availability in 1981-83 was 30% lower than it was in 1975. Because of its dominant share in the Ghanaian economy, the decline in the agricultural sector contributed in a major way to the 0.5% annual decline in the GDP between 1970 and 1982.

Ghana had a GDP of US $2,050 million in 1965, which was distributed as follows: agriculture 44%, industry 18%, and services 38%. By 1989 GDP had increased by 156% to US $5,260 million with agriculture contributing 49%, industry 17%, and services 34%. Between 1986 and 1988, the agricultural GDP rose by 1.8%, but from 1988 to 1990 the growth rate was only 0.9% as compared with 9.4% and 4.2% for industry during the two periods, respectively (Table 3.1). Thus, the growth rate of agriculture lagged behind that of industry during the structural adjustment period.

Table 3.1. Annual Growth in Gross Domestic Product by Sector, 1986-2000

	Actual		Projection	
	1986-88	1988-90	1990-95	1995-2000
	----- (%) -----		----- (%) -----	
Agriculture	1.8	0.9	2.8	3.4
Cocoa	-1.6	3.3	1.3	1.9
Forestry	2.5	2.4	1.0	1.0
Other	2.4	0.1	3.4	4.0
Industry	9.4	4.2	10.4	9.1
Mining	12.8	10.0	17.7	5.2
Manufacturing	7.5	2.8	9.4	9.7
Utilities	15.8	8.3	9.7	9.7
Construction	12.1	4.7	9.5	9.7
Others	8.6	7.2	4.9	4.9
Transport	10.5	9.9	6.0	6.0
Wholesale and Retail	12.3	10.0	5.1	5.0
Financial Services	6.1	5.6	5.8	6.0
Public Administration	5.6	4.3	3.3	3.0
GDP	4.9	4.7	4.9	5.2

Source: World Bank (1991).

Ghana's crop production increased significantly in the late 1980s (Table 3.2). This success was due to improved incentives, appropriate structural changes within the Ministry of Agriculture, timely availability of inputs, and favorable weather. Farmers responded positively to the new incentives by increasing production of the basic staples, cocoa, and other export crops, especially pineapples. In 1989 cereals output was 22% higher than the 1984 level. All crops except rice experienced increases in output. Likewise, production of yam, cotton, groundnut, and cocoa also increased significantly. Cotton production increased more than twentyfold. The increased crop output resulted mostly from area expansion. Improvements in yields also made a small contribution. Increases in area cultivated have been significant for maize, whereas the other coarse grains and rice have yet to surpass previous levels of planted area.

Despite these achievements in the agricultural sector, there was a food-grain deficit in 1987 of about 128,000 tons or about 6% of demand, which was met by imports. The deficit is expected to increase to about 750,000 tons by the

Table 3.2. Ghana: Production of Selected Crops, 1984 and 1989

	Crops	1984	1989	Change
		---- ('000 tons) ----		(%)
I.	**Cereals**	965	1,177	22
	Maize	574	715	25
	Sorghum	176	215	22
	Millet	139	180	29
	Rice	76	67	(12)
II.	**Root Crops**	4,790	4,600	(4)
	Cassava	4,065	3,320	(18)
	Yam	725	1,280	77
III.	**Cash Crops**			
	Cotton	260	5,784	2,125
	Groundnut	167	200	20
	Cocoa	174	295	70

Source: PPMED, Ministry of Agriculture, Accra, Ghana.

year 2000 if the necessary steps are not taken (Ministry of Agriculture, 1990).

3.2 Trends in Crop Production

3.2.1 Area Under Production–Farmers allocate their landholdings to various crops depending upon price expectations and their food consumption needs. However, any allocation depends upon the natural endowment of the land or the suitability of the land for the cultivation of the crops under consideration. A land suitability classification for cereals shows that 3,900 ha, 3,820 ha, 300 ha, and 2,390 ha of land are highly suitable for the cultivation of maize, sorghum, upland rice, and lowland rice, respectively (Table 3.3). An additional 4,220 ha and 3,730 ha of land are moderately suitable and marginally suitable, respectively, for the cultivation of maize. The large amount of land that is suitable for maize cultivation perhaps explains why maize is grown in many parts of the country. Sorghum and rice are grown mostly in the northern sector of the country, although rice is also grown in many valley bottoms in the south, especially the Western Region.

Table 3.3. Ghana: Land Suitable for Cultivation of Cereals

Crop	S1	S2	S3
	---------- ('000 ha) ---------		
Maize	3,900	4,220	3,730
Sorghum	3,820	2,660	730
Rice Upland	300	3,080	760
Rice Lowland	2,390	300	2,250

S1 - highly suitable
S2 - moderately suitable
S3 - marginally suitable

Source: Ministry of Agriculture (1990).

During the 1970-90 period, area planted to most crops has increased. However, the area planted to crops increased dramatically from 1990 to 1991 (Table 3.4). The increase was 31% for maize, 7.9% for rice, 69% for millet, 22% for sorghum, 66% for cassava, 43% for cocoyam, 90% for yam, and 34% for plantain. These increases were preceded by significant decreases in area planted to most crops from 1989 to 1990 due to drought. The increases in area planted were mostly a result of higher prices in 1990 and good weather in 1991.

The areas allocated to various crops have followed the pattern predicted by the classical cobweb theorem (Ezekiel, 1938) where a year of high prices leads to a higher allocation of land to the crops in the following year and vice versa. For example, the area planted to maize was a low 280,000 ha in 1983, and prices were high for that year's production; consequently, 700,000 ha of land was planted to maize in 1984, and maize prices dropped that year. Farmers who seemed to operate in an adaptive expectation mode reduced the area planted to maize in 1985, and maize prices rose that year.

3.2.2 Yield Potential–Although Ghana has a tremendous potential for higher yields for most of its crops, over the years yields on farmers' fields have either stagnated or risen slightly, and in some cases they have even dropped (Figures 3.1-3.4 and Table 3.5). When maize, rice, and yam yields are compared, it is found that there has been an increasing trend from 1984 when reforms were introduced into the agricultural sector.

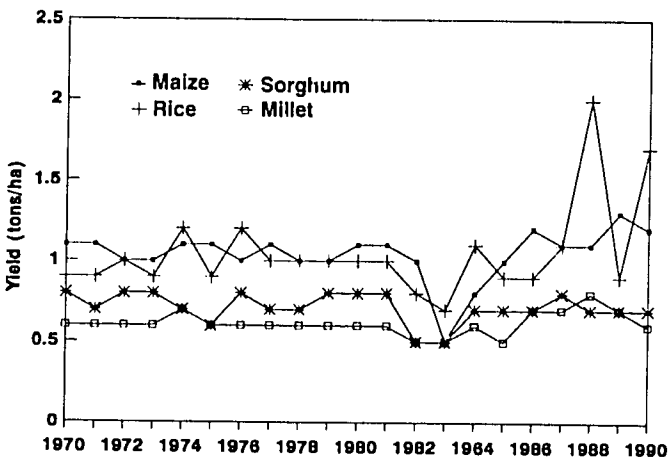
An active research program in Ghana has resulted in the availability of maize varieties with high-yield potential–nearly 8 tons/ha under experimental conditions (Ghana Grain Development Project, 1985). It should be possible to obtain 3-4 tons/ha of maize yields on farmers' fields in many locations in Ghana. After a substantial drop in maize yield in 1983 due to drought, there was an increasing trend in yield from 1984 to 1989 with a peak yield of about 1.4 tons/ha. There are regional differences in the yield of maize. The Brong Ahafo region registered the highest yield of almost 2 tons/ha in 1988, and the least was the Upper East region, which obtained 0.80 ton/ha (Table 3.6). Many of the maize varieties that have been released are susceptible to streak virus. However, the disease does not seem to pose a serious problem if recommended agronomic practices are followed.

In the case of rice, although the research activities have not been vigorous in Ghana, the country has access to good seeds developed in similar ecological zones. The International Institute for Tropical Agriculture (IITA) has released a few

Table 3.4. Ghana: Area Under Important Crops, 1970-91

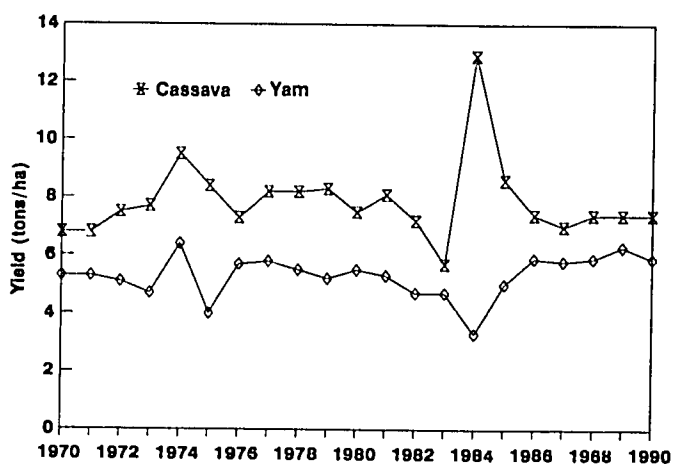
Year	Maize	Rice	Sorghum	Millet	Cassava	Yam	Cocoyam	Plantain	Groundnut	Beans
					('000 ha)					
1970	452	55	243	218	351	172	259	188	98	121
1971	433	61	233	230	351	172	259	288	98	121
1972	339	70	200	175	380	134	258	305	98	103
1973	425	67	221	192	373	130	261	336	91	83
1974	424	66	215	222	289	133	284	343	111	125
1975	320	79	208	199	286	177	205	230	102	125
1976	273	77	248	243	250	100	167	211	91	139
1977	291	61	188	233	257	86	135	131	84	99
1978	258	59	184	204	283	94	144	152	69	88
1979	314	61	210	253	280	109	145	133	90	96
1980	320	65	208	230	386	95	157	156	84	121
1981	316	46	224	218	337	88	207	135	119	176
1982	276	44	243	225	275	78	167	137	115	161
1983	280	39	214	214	242	75	145	141	95	126
1984	723	69	251	231	814	223	396	333	149	138
1985	405	87	250	222	355	111	200	270	119	110
1986	472	76	176	157	387	179	201	191	163	206
1987	548	72	272	235	390	204	196	170	151	160
1988	540	52	226	228	354	168	141	119	131	112
1989	567	72	284	244	415	217	207	164	159	168
1990	465	88	215	124	323	119	142	129	-	-
1991	610	95	263	209	535	227	203	174	-	-

Source: PPMED (Statistics Division), Ministry of Agriculture, October 1989.



Source: Ministry of Agriculture, PPMED, Statistics Division.

Figure 3.1. Ghana: Yields of Cereal Crops, 1970-90.



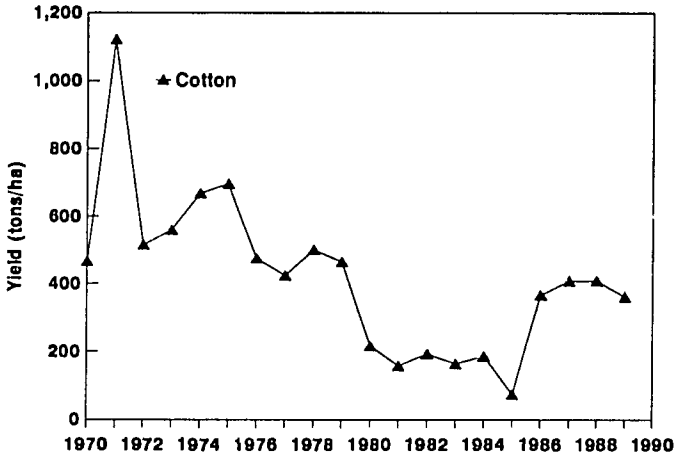
Source: Ministry of Agriculture, PPMED, Statistics Division.

Figure 3.2. Ghana: Yields of Root Crops, 1970-90.

rice varieties, and some of them have been adapted to the Ghanaian environment with experimental output reaching 7 tons/ha. However, average yields on farmers' fields have been about 1 ton/ha except in 1989 when the average yield was over 1.5 tons/ha.

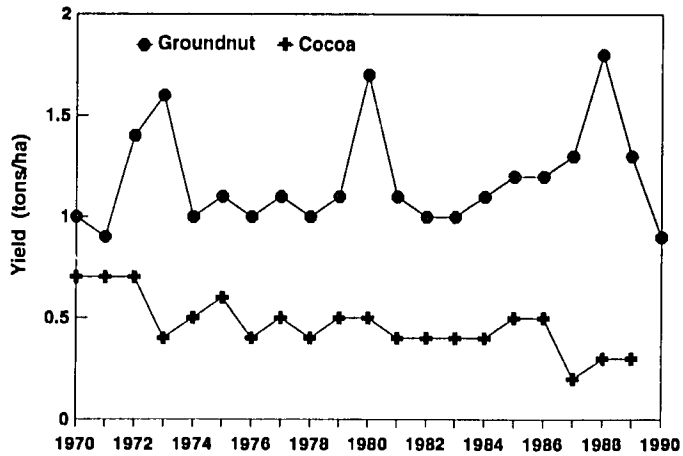
Sorghum and millet research has been going on at the Nyankpala Agricultural Research Station, but no major breakthrough has yet been achieved. The Station is participating in international networks for the screening of millet and sorghum varieties. Sorghum yields have been about 0.7 ton/ha, and millet yields have been about 0.6 ton/ha.

Historically, cassava yields have been around 8 tons/ha although there is potential for much higher yields as obtained in countries with similar climatic and ecological conditions. Under the National Roots and Tubers Improvement Programme, efforts are being made to improve the germplasm of cassava, yam, cocoyam, and plantain. Not many varieties have yet been released for recommendations to farmers,



Source: Ghana Cotton Company, Accra (1991).

Figure 3.3. Ghana: Yield of Cotton, 1970-90.



Source: Ghana Cocoa Board, Accra and Ministry of Agriculture, PPMED, Statistics Division.

Figure 3.4. Ghana: Yields of Cash Crops, 1970-90.

Table 3.5. Ghana: Yields of Important Crops, 1970-90

Crop	1970	1980	1990
		(tons/ha)	
Maize	1.1	1.1	1.2
Rice	0.9	1.0	1.7
Sorghum	0.8	0.8	0.7
Millet	0.6	0.6	0.6
Cassava	6.3	7.5	7.4
Yam	5.3	5.5	5.9
Groundnut	1.0	1.1	0.9

Source: Ministry of Agriculture, Accra, Ghana.

but it is known that yields can be increased about threefold by improving the agronomic practices.

Although groundnut production has been increasing, the increase has been due more to area expansion than to productivity increases in that yields have remained at about 1 ton/ha for the past 20 years. If cultural practices are improved, it is possible to double yields on farmers' fields.

The high-yielding varieties of cowpeas available in Ghana have come from external sources with active local research currently proceeding. Lately yields have been increasing slightly, but generally they have been about 0.1 ton/ha.

Soyabean is gaining popularity among farmers. Some of the varieties that have been identified have yield potentials of about 2 tons/ha.

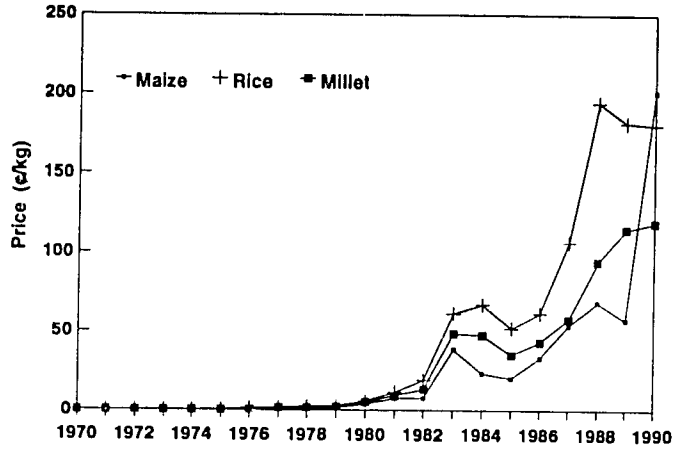
Although natural problems or constraints have, to some extent, contributed to the low yield of crops cultivated in Ghana, better management of the available resources can allow farmers to realize a substantial proportion of the high yields that are obtained on experimental plots. Such management involves application of appropriate fertilizers in the right amounts and timely cultural practices.

Table 3.6. Ghana: Yield Estimate for Maize by Region, 1988

Region	Yield
	(tons/ha)
Western	1.17
Central	1.66
Eastern	1.34
Greater Accra	1.40
Volta	1.50
Ashanti	1.57
Brong Ahafo	1.99
Northern	1.12
Upper West	1.10
Upper East	0.80
National	1.39

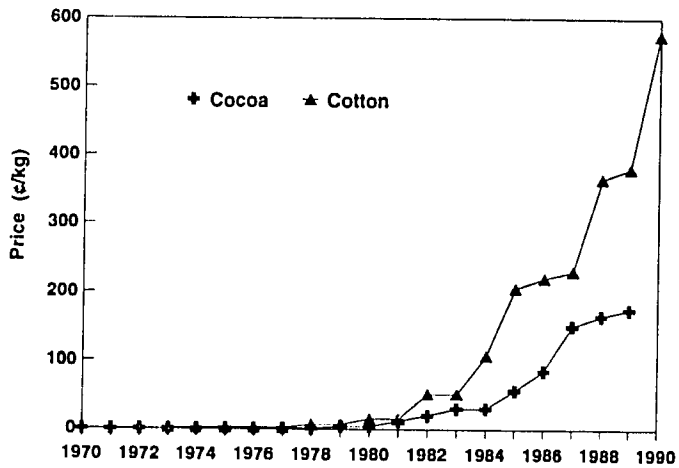
Source: Ministry of Agriculture, PPMED, Accra.

3.2.3 Output and Prices–As pointed out under area cropped, crop production has been directly related to the price of the output in the previous year, all other things being unchanged (*ceteris paribus*). In 1984 the efforts of farmers and good rainfall made Ghana nearly self-sufficient in maize production. However, the good harvest led to a sharp decline in output prices in the absence of a well-designed post-harvest management program to handle the crop (Figure 3.5). Farmers reacted to the low output prices by reducing their production in 1985. For example, maize production, which fell to an all-time low of 141,000 tons in 1983, increased to 574,000 in 1984 but fell to 411,000 tons in 1985 largely because of the adverse effect of the 1984 low maize prices (prices fell from ¢38,576/ton in 1983 to ¢23,337/ton in 1984). Although cereal prices fluctuated from one year to the other, cotton and cocoa prices increased steadily during the 1980s (Figure 3.6). Increased production for these crops was absorbed by the



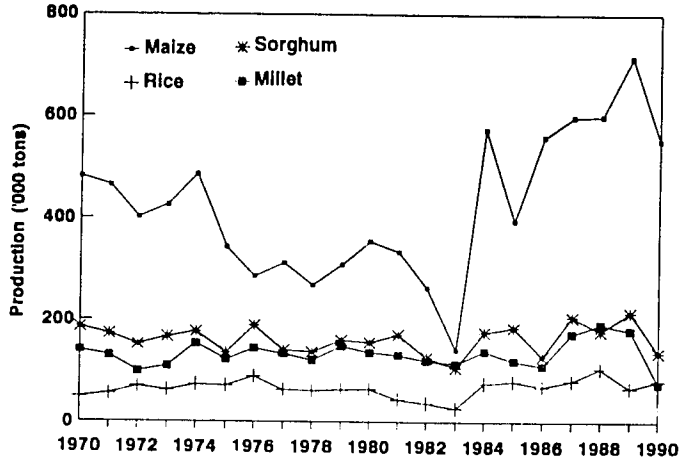
Source: Ministry of Agriculture, PPMED, Statistics Division.

Figure 3.5. Ghana: Trends in Cereal Prices, 1970-90.



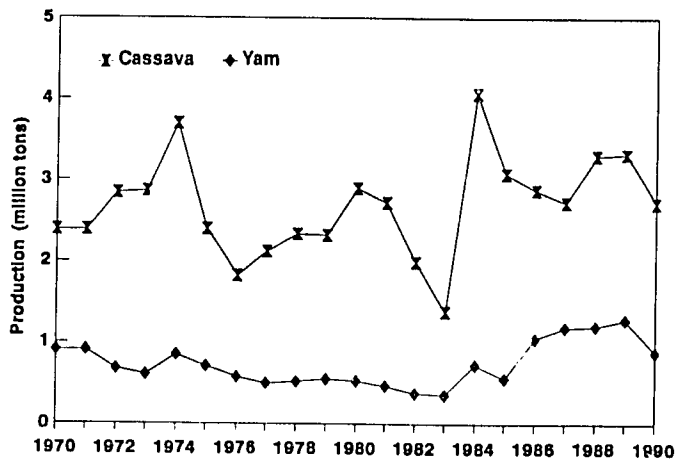
Source: Ghana Cocoa Board, and Ghana Cotton Company, Accra.

Figure 3.6. Ghana: Trends in Cocoa and Cotton Prices, 1970-90.



Source: Ministry of Agriculture, PPMED, Statistics Division.

Figure 3.7. Ghana: Trends in Production of Cereal Crops, 1970-90.

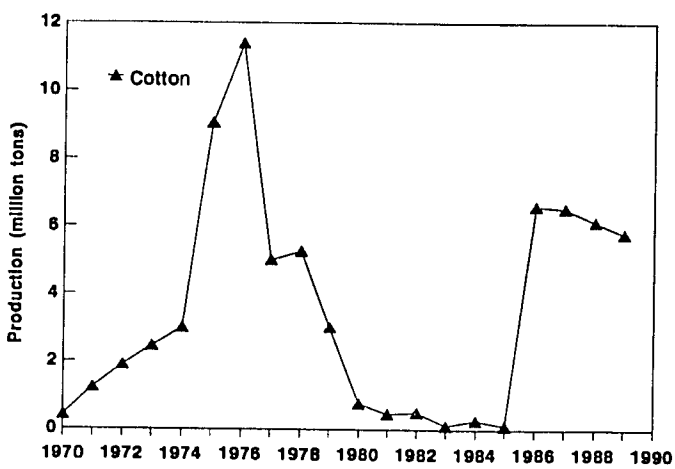


Source: Ministry of Agriculture, PPMED, Statistics Division.

Figure 3.8. Ghana: Production of Root Crops, 1970-90.

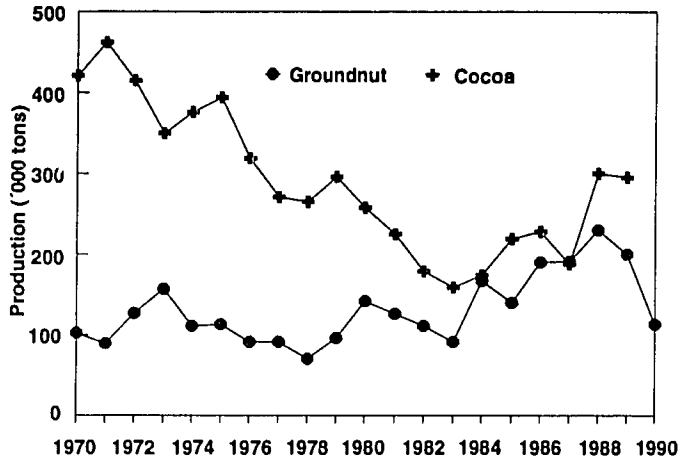
world markets and therefore shielded their prices from fluctuations.

Since 1984 there has been an increasing trend in output for most crops, especially the cereals and cotton (Figures 3.7-3.10). Cotton output increased from less than 0.3 million tons in 1983 to 5.8 million tons in 1989. There were increases in both seed and lint cotton production. Whereas increases in cereal production may be due to improved agricultural services, increases in cotton production were mainly due to improvement in cotton prices to which farmers responded positively. From 1990 to 1991, there were large increases for most of the staple crops grown in Ghana. The largest increase of 200% was recorded for yam, followed by cassava, which achieved a 109% increase in output. The major cereals also did very well with output increasing by 68%, 86%, and 77% for maize, rice, and sorghum, respectively (Table 3.7). Most of this increase in crop



Source: Ghana Cotton Company, Accra.

Figure 3.9. Ghana: Production of Cotton, 1970-90.



Source: Ghana Cocoa Board, Accra, and Ministry of Agriculture, PPMED, Statistics Division.

Figure 3.10. Ghana: Production of Cash Crops, 1970-90.

Table 3.7. Comparison of Production Estimates, 1989-91

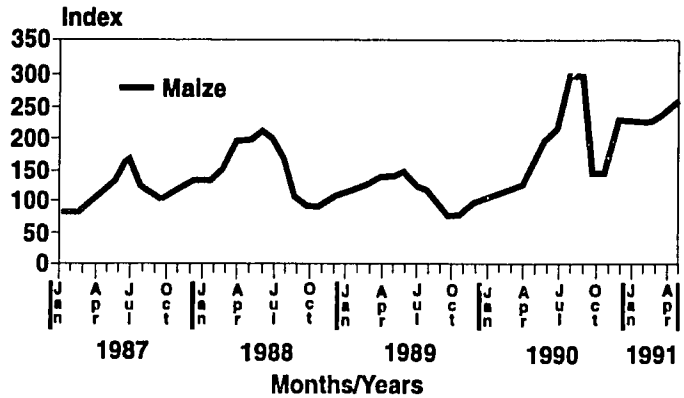
Crop	1989	1990	1991	Percent Change 1989/90	Percent Change 1990/91
	('000 tons)				
Maize	715	553	931	-22.7	+68.4
Rice	67	81	151	+20.8	+86.4
Millet	200	74	113	-63.0	+52.7
Sorghum	300	136	241	-54.7	+77.2
Cassava	3,320	2,717	5,701	-1.82	+109.8
Cocoyam	1,200	814	1,297	-32.2	+59.3
Yam	1,280	877	2,632	-31.5	+200.1
Plantain	1,040	798	1,178	-23.3	+47.6

Source: Ministry of Agriculture, Accra, Ghana.

output was a result of an increase in cultivated area (a result of the 1990 high prices) and good weather.

Apart from annual changes in price, which occur in response to changes in crop output resulting from changes in area planted to the crop, there are intra-year variations in price, especially for cereals, which are cultivated at specific periods of the year but consumed throughout the year (Figure 3.11). Because of the inelastic nature of demand for food commodities, prices tend to be low at harvest time and high during the offseason. Table 3.8 presents seasonal price indices for the major cereals; the lowest prices for maize occur in September when most of the main-season maize is harvested, and the highest prices are encountered in June.

There are regional differences in prices, especially between production and consumption areas; however, many studies have concluded that at least the cereal markets are



Base Month: September 1987 = 100

Figure 3.11. Price Trend of Maize, January 1987-April 1991.

Table 3.8. Ghana: Seasonal Price Fluctuations for Cereals (Index Numbers[a])

	Maize	Millet	Sorghum	Rice
January	81.0	74.0	69.7	78.0
February	92.4	79.0	75.5	88.0
March	101.7	88.0	81.8	87.0
April	121.5	90.0	92.1	96.0
May	134.3	108.0	102.3	101.0
June	145.7	122.0	108.4	106.0
July	115.3	122.0	109.9	115.0
August	81.6	115.0	120.8	120.0
September	69.0	113.0	117.4	111.0
October	77.0	96.0	119.4	100.0
November	88.2	101.0	110.3	100.0
December	92.1	94.0	92.4	95.0

a. Average of 1985-88 annual price=100.0.

Source: Asante et al. (1989).

integrated,[3] that is, a disturbance in one market is stochastically transmitted to the other markets. This is made possible by the activities of itinerant traders who move from place to place buying produce to sell.

3.3 Technological Transformation of Agriculture

Agriculture in Ghana has generally been traditional in nature. Most farms are less than 5 ha in size, and the farmers use simple implements with little or no fertilizer. With less than 8,000 ha of land under irrigation, Ghanaian agriculture is generally rainfed and output is invariably related to the amount and pattern of rainfall.

The long history of agricultural research in Ghana has led to the development of technology which, if it had been adopted, would have transformed the country's agriculture to a developed one. Research has been conducted in

3. See Asante et al. (1989) for details.

developing high-yielding varieties of various crops and agronomic practices that would ensure the realization of the full potential of these varieties. Basic technologies related to agronomic practices such as land preparation, time of operations, planting spaces, weed control, and plant protection are also available although certain aspects need to be improved and refined. The yield potential of the major food crops is discussed in Section 3.2.2.

Post-harvest losses are known to be substantial in Ghana. Estimates given are 20%-30%. Such high storage losses are quoted even though storage technologies exist to ensure minimal losses. There are chemical, physical, and biological storage technologies in Ghana. Through chemical means, mild insecticides and insect repellents such as wood ash and certain plant leaves could be used to reduce waste during storage. Physically, post-harvest losses can be reduced by constructing cribs and homemade silos that can keep produce longer with minimal wastage. As a biological means, the farmer should use crop varieties that can be stored more satisfactorily.

Technologies for agroprocessing are now receiving some attention. What are the best ways of increasing the quality and throughput of traditional processes? There are traditional processes for making gari,[4] producing sheabutter, and extracting palm oil that need to be improved upon. The introduction of small oil palm presses has increased the productivity of palm oil extracts tremendously. Small-scale rice mills and flour mills are also emerging. The emphasis on technology for small- to medium-scale operations has a lot of promise for transforming Ghanaian agriculture, especially when the large-scale processing plants have been a failure in the past. The processing can help increase the demand for primary products, which can in turn raise farm prices and serve as an incentive for increased production.

Much farm work is done by hand or simple tools. For instance, threshing of sorghum is done with a stick; for harvesting of rice, the cutlass is used; for weeding, the hoe or cutlass is used; for carrying goods in the rural areas, headloading is the most common means. Carts that are hand pulled or animal drawn are not common. Simple tools are needed to increase the efficiency of the farmer. Hoes can be improved in weight, shape of blade, and the length of handle to make the work easier. For shelling of corn, simple corn shellers manufactured locally can be used. Threshing of rice can be done with simple inexpensive threshers.

In order to transform agriculture in Ghana, the productivity of the smallholder agriculture must be increased. The existing technologies can help increase output by more than twofold if farmers will adopt them. Farmers need to be informed about the returns to improved practices and be taught how to implement them. The current revitalization of the extension service in the agricultural strategy is therefore a step in the right direction. To complement the efforts of extension staff, improved seed, fertilizer, insecticides, and herbicides must be made available in the farming communities during the cropping season.

4. Gari is a flour derived from cassava.

3.4 Constraints to Agricultural Growth

In a survey of 700 farmers in seven districts in the project area of the Smallholder Credit Input and Marketing Project (SCIMP) being financed by the International Fund for Agricultural Development (IFAD), it was found that nearly 77% of the respondents do not consider land to pose any constraint to agricultural growth (Table 3.9). Money to finance the farm operations is considered to be the major constraint to the operation of the farm business. For fertilizer, 42.2% of the respondents did not think it posed any constraint, 26.3% of them said it posed a low constraint, and 31.5% of them considered it to be a high constraint to the expansion of their operations. Factors constraining agricultural operations vary from one district to the other (Table 3.10). For instance, 77% of the respondents in Kintampo, 79% in Techiman (Brong-Ahafo Region), and 84% in Nkwanta (Volta Region) considered hired labor to be a constraint to the expansion of their operations, whereas only 13% in Sekyere East (Ashanti Region) considered it such.

Table 3.9. Ghana: Factors Constraining Agricultural Operations, 1990[a]

Factor	No Constraint	Low Constraint	High Constraint
		(%)	
Land	77.2	8.9	13.9
Machinery/ Implements	29.8	16.1	54.1
Equity funds	2.0	10.3	87.7
Credit	2.3	5.0	92.7
Improved seed	36.5	29.2	34.3
Fertilizer	42.2	26.3	31.5
Family labor	52.4	22.4	25.2
Hired labor	42.2	28.5	29.3
Storage	64.4	15.0	16.6
Marketing	77.0	9.2	13.8

a. Survey based on 700 farmers.

Source: Agroplan (1992).

3.4.1 Land–Access to land does not pose a constraint to agricultural development in Ghana. Indigenous land tenure systems consisting of community ownership have always ensured availability of land to the people of the area. Even with increasing desocialization or privatization of land, new modes

Table 3.10. Ghana: Factors Constraining Expansion of Farm Operations by District (Percent of Farmers Reporting)[a]

Factor	Ashanti Region		Brong-Ahafo Region			Volta Region	
	Offinso	Sekyere East	Kintampo	Techiman	Sunyani	Nkwanta	Hohoe
Land	8	36	19	31	23	14	29
Machinery	50	1	92	88	66	89	88
Equity Capital	98	96	100	99	98	95	100
Credit	97	96	100	98	98	95	100
Improved Seeds	48	44	87	47	74	61	84
Fertilizer	51	12	93	25	77	66	81
Family labor	66	43	67	50	41	51	61
Hired labor	42	13	77	79	44	84	65
Storage	31	16	68	55	15	41	2
Marketing	31	6	39	35	0	50	1

a. Survey based on 100 farmers per district.

Source: Agroplan (1992).

of access to land have evolved, including sharecropping arrangements, outright sale, and pledges. Several land tenure studies have concluded that there is no evidence of tenure insecurity contributing to agricultural inefficiency. Tenure security is high as measured by rights over land and low incidence of disputes, except for a few migrant farmers from other areas. It is therefore not surprising that many farmers do not consider land to be a constraint to agricultural development.

The present land tenure system imposes three major constraints on growth: (1) it limits access to credit, (2) it discourages replanting of tree crops because most of the operators are sharecroppers, and (3) it discourages land improvements.

3.4.2 Machinery and Implements–Under the Agricultural Services Rehabilitation Programme, the Ministry of Agriculture divested itself from machinery-operating services except for land clearing where the initial investment is huge. As a result, many private tractor-hiring services emerged in the areas where the topography allows for mechanical operations. Because these services are needed at the same time, it is difficult for the operators to cope; some farmers, therefore, do not get the services when they need them. For some farmers, the high rental charges completely price them out of the market and force them to resort to manual operations when in fact they would have wished to use machinery.

Because of cost and availability of machinery, the use of animal draft power is becoming very important, especially in the North. The Ministry of Agriculture and some private organizations have set up training programs to train the animals and the farmers. The University of Ghana Agricultural Research Station (Legon) has set up one such training program for southern farmers. An implement factory has been established in Tamale to manufacture appropriate implements for the bullocks. Because of the local culture, animal draft power has not been popular with many farmers in the southern sector of the country. There exists a high potential for using animal draft power to expand farm operations in the transitional zone if the farmers can be educated about the use and care of bullocks.

3.4.3 Finance–Funds from personal/family savings and relatives have been the major source of financing for many farmers. However, the low returns from the farming operations make it difficult to expand the operations because essential inputs cannot be paid for. Attempts to improve upon farm financing through credit have not been successful either because of lack of interest from the financial institutions or lack of enthusiasm from the farmers who are usually scared of being in debt and consider the loan application process cumbersome and a waste of time. Where a credit program is successfully instituted, many farmers consider the funds to be grants, and loan recoveries tend to be low. A recent example is the Global 2000 credit scheme, which started nicely with loan recoveries of over 90% and then slid into problems of repayment when the program expanded.

3.4.4 Improved Seed–Improvement of crop varieties is one of the major areas of crop research in Ghana. Improved varieties are available for almost all the cereal (except sorghum/millet) crops and legumes. The

problem farmers face is availability of the seeds in their localities.

Before October 1989, the Ghana Seed Company was charged with the development of commercial seed production. However, due to its poor performance, the Ghana Seed Company was closed down on October 1, 1989, and private firms were allowed to produce and distribute certified seed in the country. The production of breeder seed was left to the research institutes and that of foundation seed to the research institutes and registered private growers. Since privatization of commercial seed production, some farmers have still found it difficult to get access to improved seed.

Table 3.11 shows that only 56 registered maize seed growers and 7 rice seed growers operated in the whole country in 1990. Although maize is grown in every part of the country, there were no maize seed growers in the Northern, Western, Upper East, and Upper West regions, and all the seven rice seed growers were in the Northern region. This has resulted in the use of seed from farmers' produce. A survey of 300 farmers in Hohoe (Volta Region), Savelugu (Northern Region), and Nkoranza (Brong-Ahafo Region) districts revealed that, in 1989, 54.6% of the maize farmers and 81.4% of the rice farmers used seed from either their farms or their neighbors' farms (Agroplan, 1992). In 1990, 64.1% of maize farmers and 75.4% of rice farmers used seed stored by them or by another farmer. Because of the open-pollination nature of the improved varieties, the high-yielding capacity of the seed is lost if seed from the same stock is used year after year. It is therefore advisable for the farmers to purchase certified improved seed every year for planting.

Table 3.11. Ghana: Certified Seed Growers by Region, 1990

Region	Maize	Rice
Ashanti	9	-
Brong Ahafo	16	-
Central	12	-
Eastern	8	-
Greater Accra	2	-
Northern	-	7
Volta	9	-
Western	-	-
Upper West	-	-
Upper East	-	-
Total	56	7

Source: Ministry of Agriculture, Crops Services Dept.

3.4.5 Fertilizer–Although there are a few exceptions, in general the soils in Ghana are fairly good for the cultivation of various crops. One major problem with Ghanaian soils is the low levels of available nitrogen and phosphorus. This is a major factor for the low yield of cereal crops obtained throughout the country. The problem has been exacerbated by the reduction in the fallow period, which is a result of the population pressure. Even in places where the nitrogen and phosphorus supplies are adequate, intensive cropping tends to deplete the soils of the available nutrients; therefore, it is necessary that they be replaced. It was indicated in Chapter 1 that about 90,000 tons of nutrients/year are depleted from the soil by major crops. The amount of depletion implies that large amounts of fertilizers are needed to maintain soil fertility.

Despite the low levels of available nitrogen and phosphorus, fertilizer use in Ghana is very low. Based on FAO data, in 1990, fertilizer use per hectare was 4.5 kg compared with 5.4 kg in Mali, 12.1 kg in Nigeria, and 48.1 kg in Kenya. Many farmers do not use fertilizers, and those who use them generally apply them to maize and rice crops. During a survey of 700 farmers in selected districts in the Ashanti, Brong Ahafo, and Volta regions, only 16.5% of the farmers interviewed used fertilizer on their maize and 29% on rice. Many of the farmers applied less than the recommended amounts of fertilizer (Agroplan, 1992).

During 1988-90, fertilizer use in Ghana averaged about 11,000 nutrient tons, against 90,000 tons removed by various crops. Thus the depletion of nutrients from soils is becoming a serious constraint on soil fertility and crop productivity in Ghana.

3.4.6 Labor–Because of its manual nature, labor is an important input in agricultural production in Ghana. In the past, farmers relied on family labor for most of the operations; however, as family labor has become relatively scarce with increased schooling of children and migration of young people to urban areas, farmers have increasingly used hired labor. Although demand has increased, the supply of hired labor has decreased as rural-urban migration has intensified. Therefore, farmers are finding it more difficult to get hired labor at the time when they need it. This has bid up the price of farm labor, which has risen to more than twice the wage rate for urban unskilled labor. The farm laborer works for about 4 hours a day and gets served lunch during the period. Because fertilizer use is labor intensive, scarcity of labor in rural areas will influence fertilizer use.

3.4.7 Storage–Farm produce storage is provided by the Ghana Food Distribution Corporation (GFDC), which has about 50,000 tons of storage space comprising 17,500 tons of silo space and about 32,000 tons of warehouse space.

The Corporation has plans to construct or acquire additional storage space comprising 24,750 tons silo space and 31,500 tons warehouse space. Most farmers store some of their produce either at the farm or in the village in traditional cribs, or they store it in the kitchen or in rooms. The Grains and Legumes Development Board has been researching storage structures based on new cribs that will reduce storage losses due to insects and rodents. It has been found that, because of low cash balances at harvest time and the need to pay for main-season credit and buy inputs for the minor season, farmers do not use storage for any appreciable length of time except for seed.

3.4.8 Marketing–The public agency involved in grain marketing is the GFDC. The operations of the GFDC do not have much impact on the grains market because they account for only 5%-6% of the marketable surplus. Most farmers sell their produce in the village market or a market close by on specified market days. There are some itinerant traders who go to the major producing areas and buy produce and sell in the major consuming areas. These traders help in integrating the various commodity markets.

Getting a place to sell produce is not a problem; however, because most farmers sell at harvest time, the price gets depressed so much that sometimes the farmers sell below cost. One reason why farm-gate prices are low is the high marketing margins, which are invariably due to high transport costs. Hence improving infrastructures will help in enhancing the efficiency of the markets. Also better storage facilities will help in minimizing harvest time sales and the resulting dampening influence on crop prices.

3.4.9 Credit–Farmers have used credit in financing various activities including the farm business, consumption, and funerals. The major source of credit for many farmers had been money lenders who charge exorbitant interest rates. Despite the high interest rates they charge, money lenders have proven to be a very convenient source of credit to farmers because of the informality in loan applications and the fact that the loans are general (untied) in nature and not crop or enterprise specific. This enables the borrower to allocate the funds in any suitable manner.

The agricultural sector was generally charged lower interest rates until 1988. The practice of applying commercial bank interest rates differently to different sectors began in the 1970s and intensified in the early part of the 1980s. For instance, in 1983 when all loans attracted an interest rate of 9% per annum, commercial banks were directed to charge a preferential interest rate of 8% per annum to small-scale farmers whose operations did not exceed ¢50,000. In 1984, when most loans attracted an interest rate of 21%, agricultural loans attracted a rate of 14½%. In 1985, when the interest rate on loans was 23%, the rate chargeable on agricultural loans was pegged at 18½%. Between 1985 and 1988, efforts were made to narrow the differential between the interest rates charged to agricultural loans and the so-called nonpriority loans until the differential was phased out completely in 1988.

With the removal of subsidies from agricultural inputs, credit has become very important. Despite the need for credit, the commercial banks have not found it attractive to lend to farmers for various reasons. They consider agriculture to be too risky, and the cost of administering the credit tends to be too high. Even the Agricultural Development Bank (ADB), set up in 1965 to help develop agriculture, has diversified its portfolio, and agriculture is now in a residual position. The ADB has not been successful in administering small loans to peasant farmers because it proved to be administratively cumbersome and uneconomical.

The total volume of institutional lending for the agricultural sector, including forestry, was about US $51.0 million in 1987 and US $96.0 million in 1988. In 1984, although the agricultural sector contributed more than half of the GDP, it received less than one-third of institutional loans. By 1988, the situation further deteriorated, and the agricultural sector received about 16% of total loans from commercial and secondary banks (Table 3.12).

The share of agriculture in the total lending by commercial and secondary banks fell rapidly during the 1980s, especially after 1984 (Table 3.13). It is a rather disturbing trend because the need for funds had been increasing during this period. This trend is a result of two factors, namely, increased interest rate and removal of quotas for agricultural lending.

Given the ADB's apparent difficulties and the fact that only 9% of total commercial and development bank loans went to agriculture and this largely to large-scale farmers, the Bank of Ghana recommended the establishment of rural banks. Rural banks were to specialize in the mobilization of savings in the rural areas and the granting of credit to small-scale farmers and cottage industrialists within the rural communities where they are located. The first rural bank was opened in 1976, and by 1987 the number had grown to 110 in 9 of the 10 regions of Ghana. Currently, there are 120 rural banks. The total deposits in all rural banks rose from ¢148,000 in 1976 to ¢1,868 million in 1987, with a 427% increase in the number of account holders over the same period. The major problems faced by rural banks have been low capitalization rate and low administrative and managerial capacity. As a result, many of them do not operate under sound banking practices. This has often led to low loan recovery. Many of them are also not able to meet the high demand for credit.

Difficulties in obtaining credit in the rural areas have given rise to new forms of credit organizations. Credit unions and "susu" (informal) associations are becoming

Table 3.12. Ghana: Loans and Advances by Economic Activity, 1984 and 1988

Economic Activity	1984 Share of GDP	1984 Share of Total Loans	1988 Share of GDP	1988 Share of Total Loans
	(%)		(%)	
Agriculture	53.9	31.9	47.2	16.6
Mining and quarrying	1.1	3.6	1.4	3.3
Manufacturing	7.2	20.8	9.7	26.1
Construction	2.6	10.0	2.5	10.2
Electricity and water	0.7	0.2	1.1	0.2
Transport	4.2	5.3	4.8	5.6
Commerce and finance	18.7	22.3	21.5	30.3
Services	14.4	4.5	14.6	7.0

Source: Research Department, The Bank of Ghana, Accra.

Table 3.13. Ghana: Share of Agricultural Lending to Total Lending, 1980-89

Year	Lending by Commercial Banks	Lending by Secondary Banks
	(%)	
1980	9.6	34.4
1981	16.2	26.4
1982	21.6	41.8
1983	30.5	33.7
1984	31.9	29.7
1985	22.9	23.5
1986	17.9	18.6
1987	21.3	17.9
1988	16.6	13.0
1989	15.5	13.4

Source: *Quarterly Digest of Statistics*. Various issues.

important sources of noninstitutional credit. Members contribute regularly to the unions as a form of savings, and they are allowed to obtain credit at zero or very low interest rates. The daily deposits range from ¢10 to ¢500 in many rural areas. Farmers in rural areas have also become significant contributors to rotating savings groups, and these farmers use their funds to purchase productive inputs and trading goods.

Despite the obvious need for credit, many farmers operate their farm business with funds from family savings without resorting to the use of credit. In a 1991 survey of 700 farmers in the Offinso, Sekyere East, Kintampo, Techniman, Sunyani, Nkwanta, and Hohoe districts, only 11% of the respondents used credit (Agroplan, 1992). For those who did not use credit, 44.6% of them did not do so because it was not available and the rest gave various reasons why they do not use credit (Table 3.14). Many farmers do not finance the purchase of fertilizer from credit. Only 8.4% of the 80 farmers who used credit paid for fertilizer with the credit. About 40% of the respondents financed their seed purchases from credit. The major use of credit was for paying labor for land preparation and weeding around the crops.

In another survey of farmers in the Hohoe, Nkoranza, and Savelugu districts, it was found that the major operations financed by credit were land preparation (13.4% of those who took loans) and weeding or hoeing (14.1%). The only input that was financed from credit was seed (12.1%). The low level of allocation of credit to financing farm operations and inputs implies that a high proportion of credit goes into consumption or the financing of activities outside the farm venture. This has implications for developing a credit scheme for farmers. Credit must be seen as not only a facility for financing the farm venture but also a means of providing for the total needs of the farmer.

Table 3.14. Ghana: Reasons Assigned for Not Obtaining Credit

Reason	Percent of Non-Credit Users Responding
Do not need credit	6.3
Do not know credit sources	45.7
Cumbersome procedure	35.3
Process wastes a lot of time	30.1
Scared about loans	16.2
Do not meet conditions	7.5
Credit not available	44.6

Total number of farmers who did not obtain credit: 617

Source: Agroplan (1992).

3.4.10 Research–Ghana has a well-established institutional framework for agricultural research. There are two faculties of agriculture–at the University of Ghana and at the University of Science and Technology–and a School of Agriculture at the University of Cape Coast. Under the Council for Scientific and Industrial Research, there are six agricultural research institutes. Quasi-government research institutes like the Cocoa Research Institute of Ghana look at distinct agricultural commodities and special programs.

The 1989 review of the Ghana agricultural research system undertaken with the assistance of the International Service for National Agricultural Research (ISNAR) estimated that total research expenditure in 1987 amounted to ¢2,768.6 million, equivalent to 0.73% of agricultural GDP (AGDP) or US $0.70/ha of arable land. It is worth noting that, although Ghana's funding of agricultural research is less than 1% of AGDP, Ghana spends at least as much on the subsector as do many developing countries of similar size.

The level of funding per scientist and particularly expenditure other than salary, which shows whether scientists have adequate resources to work with, indicated a severe decline from US $20,500 in 1974 to US $10,000 in 1987 in constant 1987 U.S. dollar terms. The present level of funding for agricultural research in Ghana is grossly inadequate; hence the quality of research may not be as high as it was during the period before 1975.

When research expenditure is broken down to the major commodities, it is found that cocoa received about 45% of all research funding although it contributed only 13% to AGDP. By contrast, crops and livestock receive 50% of total funding while contributing 71% of AGDP, and funding for forestry and fisheries research remains at a low level although forestry contributes almost 16% of AGDP.

Much of the non-cocoa agricultural research effort and resources are allocated to maize. Maize received 11 person-years of research effort, whereas the roots and tubers received about 5 person-years of research effort (Table 3.15). The emphasis on maize research led to the provision of high-yielding maize varieties which are being used all over Ghana.

The most serious deficiency in the existing recommendations on agronomic practices is the absence of a systems approach. For instance, there are no recommendations for crop rotations, and recommendations of fertilizers considering the residual effect of fertilizer applied in previous seasons are not available. Agronomic practices should be looked at in the context of the total farming systems of the household because one practice affects the farmer's decision on resource allocation for other activities.

The recommendations for fertilizer application with regards to the application rate, timing, and placement for various crops are available. There is, however, the need to further refine the application methods. In recent years, there has been some effort to increase the cost effectiveness of fertilizer importation and use. Before then, the major forms of fertilizers imported to Ghana had been the low-analysis materials such as 15-15-15 and ammonium sulfate (21-0-0). Since 1989 these low-analysis materials have gradually been replaced by high-analysis fertilizers such as NPKs (20-20-0, 25-15-5) and urea (46-0-0).

Table 3.15. Ghana: Agricultural Research Program, 1988

Subsector	Number of Researchers	Person-Years
Maize	32	10.9
Cowpeas	23	5.1
Root crops	28	5.1
Other crops	237	56.4
Cocoa	27	16.2
Livestock	89	25.3
Forestry	20	8.8
Fisheries	16	6.3
Water	11	3.5
Food Processing	49	14.5
Biogas/Solar	2	0.4
Total	534	152.7

Source: ISNAR (1989).

3.4.11 Extension–The decline of the economy in the 1970s and early 1980s also led to a deterioration in extension services. Extension workers did not have equipment to work with, and the training program broke down to the extent that they did not have messages to pass on to the farmers. Disgruntled frontline staff left the service, and the farmer-extension agent ratio increased to unmanageable proportions. As part of the agricultural sector reforms, a Department of Agricultural Extension Services (DAES) was created in 1987 with the aim of unifying all extension activities which hitherto had been carried out by different departments in the Ministry of Agriculture.

The objective of DAES was to improve extension services by the following:

1. Upgrading the technical competence of extension staff through systematic training.
2. Intensifying the transfer of technology and improved agronomic practices to farmers in order to increase productivity and improve upon the living standards of the farm family by:
   a. Regular farm and home visits.
   b. On-farm demonstrations.

c. Food and nutrition demonstration.
d. Regular farmer meetings.

The Department used the Training and Visit (T & V) approach in trying to achieve its objective. Extension staff were trained by subject matter specialists at periodic meetings, and specific messages were carried to the farmer during visits. To make extension effective, there is a need to forge a link among researchers, extension staff, and farmers. This link can be maintained if researchers are used as subject matter specialists and extension staff regularly visit farmers.

In 1987/88, compared with a target of 96 training sessions and 48 workshops, 134 fortnightly training sessions and 21 workshops were actually undertaken. In 1989/90 the DAES planned 4,004 fortnightly training sessions, but it was able to offer only 2,576 of them. An additional 189 monthly training sessions were offered when it was realized that the fortnightly ones had become tedious.

Because of staff shortage, the DAES has selected some farmers as contact farmers; these farmers are visited regularly, and demonstrations are set up on some plots. Each contact farmer has a number of followup farmers who are supposed to pick up improved practices from them. In 1989/90 there were 237,277 contact farmers and 1,915,507 followup farmers. In 1987/88 there were 32,460 farmer meetings and visits, whereas in 1989/90 there were 220,280 of them. In 1987/88, 13,392 demonstrations were set up nationwide, whereas in 1989/90 there were 43,806 demonstrations. The demonstrations were carried out on maize, pepper, yam minisett, and plantain.

One of the major problems facing the DAES is the inadequate number of frontline staff (FLS) or farm-level extension workers. Before the reorganization of the department, the extension staff/farmer ratio was as high as 1:5000. It was thus impossible to see the farmers regularly even if the staff were mobile. In order to redress the situation, the department embarked on an aggressive recruitment drive. Between 1986 and 1988, the number of FLS increased to 1,953, representing a 50% achievement and a staff/farmer ratio of 1:3000. From 1989 to 1990, the number of FLS reached 2,480 or 63.8% of the target. This figure, however, compares unfavorably with the 14,000 cocoa extension staff of the Ghana Cocoa Board, which caters to only cocoa farmers.

The improvement in the services of DAES would not have been possible except for two externally assisted projects. The World Bank-funded Agricultural Services Rehabilitation Programme (ASRP) and the USAID-funded Agricultural Productivity Promotion Programme (APPP) have provided logistical needs and equipment to facilitate extension delivery. For instance, in 1987/88 ASRP provided funds for the purchase of 5 pickups, 85 motorbikes, and 544 bicycles. In 1988-90, 77 vehicles and 505 motorbikes were purchased through ASRP and APPP.

3.5 The Role of Women in Agriculture

The role of women in the social and economic life of Ghana cannot be overstressed. Women constitute about half of the total population of Ghana and about 47% of the labor force. They account for 70% of the total food crop production; almost all the harvested food crops and firewood are headloaded from farm to village and from the village to the market by women and children. They process and market nearly all the grain and starchy staple foods, and about 30% of the heads of households are women. The number of women farmers has been increasing at a faster rate than that of men (Table 3.16). Between 1970 and 1984, the number of women farmers increased by 102% compared to 72% for men, and by 1984 women farmers outnumbered men in the Western, Central, Eastern, Volta, and Ashanti regions.

Because women are responsible for a variety of chores, they need labor-saving and productivity-enhancing technologies that will improve their welfare. Specifically, the following are needed:

1. Development of effective technologies for the crops that are mainly handled by women, for example, home garden vegetables.
2. Modification of farm tools suitable to women's physical condition.
3. Development of the tools and devices used especially for the work undertaken by women. Devices for drawing water and carrying firewood and for food processing at home.
4. Provision of water in the village to reduce the time women spend in fetching water.

Table 3.16. Ghana: Gender Composition of Farmers, 1970 and 1984

Gender	1970	1984	% Increase
Male ('000)	1,015.1	1,750.3	72
Female ('000)	771.1	1,561.2	102
Total	1,786.2	3,311.5	82

Source: Ministry of Agriculture (1990).

Chapter 4
Fertilizer Sector Development

4.1 Introduction

As the discussion in Chapter 3 indicates, Ghana's agricultural sector has considerable untapped potential that, if realized, can accelerate growth in agricultural GDP from less than 2% in the 1980s to over 4% in the 1990s and beyond.

The realization of this potential depends critically on a technological transformation of the agricultural sector. Such technological transformation requires the adoption of new and improved methods of cultivation consisting of new crop varieties, fertilizers, and cultural practices. Increased population pressure also requires a continuous cultivation of land as against the shifting cultivation practice of the past.

A move from shifting cultivation to continuous cultivation leads to the shortening of fallows needed for replenishing nutrients removed by crops. The shortening of fallows results in the depletion of nutrients from the soil and loss of soil fertility. Hence, to restore soil fertility, removed nutrients should be replaced. Such replacement is possible only by applying additional and increased doses of organic and inorganic fertilizers. Increased use of fertilizers not only helps in restoring soil fertility to its natural level but also enhances the adoption of improved crop varieties, which require heavy doses of fertilizers.

Thus in both restoring the soil fertility and facilitating the adoption of new crop technologies, fertilizers play an important role. In many countries, increased use of fertilizers has become synonymous with modern agriculture and can be used as an index of technological transformation of agriculture.

To assess the progress made by Ghana in promoting fertilizer use, various facets of the fertilizer sector are analyzed in this chapter. Specifically, the chapter analyzes trends in fertilizer use, supply, and prices; regional patterns of fertilizer use; and marketing and distribution arrangements.

4.2 Data

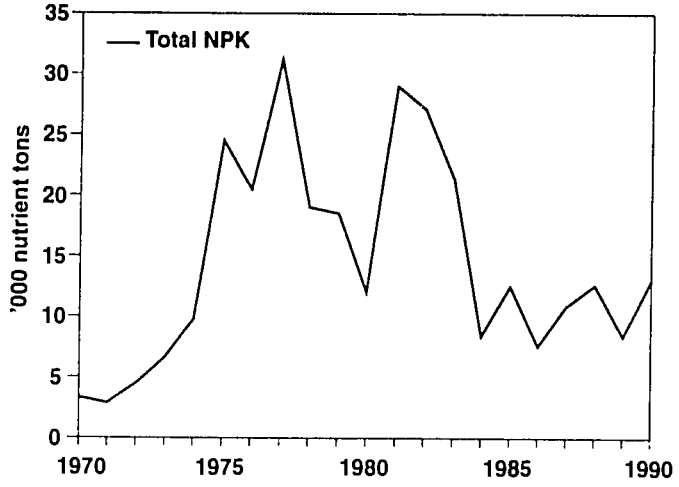
Before an analysis is undertaken of the trends in fertilizer use and supply and other related variables, it is important to describe several limitations of the data used in this section. First, although an attempt was made to develop a long time series (1970-90) on many indicators, paucity of data has prevented such efforts. Time series data are incomplete for many variables, and therefore analysis is restricted to the available data. Second, data on fertilizer use are far from perfect. Data used in this section are from various sources, including FAO and the Ministry of Agriculture. In the 1960s and 1970s, estimates of fertilizer use were prepared by the statistical authorities in Ghana. These estimates were based on fertilizer imports. Because no information was available on stocks, it was assumed in preparing such estimates that all the imported quantities were used in the same year. FAO data, based on such estimates, reflect apparent consumption. That is, fertilizer consumption was equal to fertilizer supply (consisting mainly of imports). An analysis of trends in consumption thus reflects trends in imports. In such a situation, apparent fertilizer consumption is dependent mostly on macroeconomic variables like exchange rate, availability of foreign exchange, foreign aid, global fertilizer prices, and available local funds for transportation and distribution. Third, until 1988, the fertilizer market in Ghana was a managed market in which public policy and state agencies played a dominant role in determining imports, prices, and marketing and distribution. Hence trends in fertilizer supply and use reveal a hybrid picture resulting from actions of farmers and preferences of policymakers. In 1988, private dealers were allowed to market fertilizers, although the policy of panterritorial pricing remained in effect until 1991. Thus, during the 1970-90 period, Ghana had no free market in fertilizer products.

These limitations of data restrict sophisticated econometric modeling because many underlying assumptions of such modeling exercises are not satisfied by these data. In spite of these limitations, the data contained in this section and elsewhere in the study are valuable and throw sufficient light to draw some meaningful conclusions.

4.3 Trends in Fertilizer Use

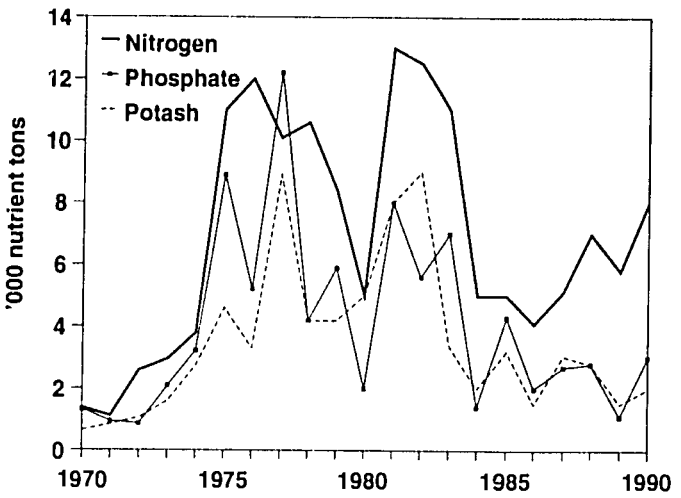
Fertilizer use in Ghana was rather modest in the 1960s, increased rapidly in the 1970s, and decreased dramatically in the 1980s. Ghana's fertilizer use increased from less than 500 tons of nutrients in 1960 to 3,343 tons in 1970 and 31,000 tons in 1977 (Figure 4.1). Between 1977 and 1981, fertilizer use fluctuated widely; it decreased to 13,000 tons in 1980 but recovered to 29,000 tons in 1981. After 1981, fertilizer use decreased dramatically. In 1984, total fertilizer use was less than 10,000 tons of nutrients. Between 1985 and 1991, fertilizer use fluctuated between 7,000 and 13,000 tons. Fertilizer use never recovered to the peak levels of the 1977-81 period.

Ghana's performance in fertilizer use was of contrasting nature in the 1970s and 1980s. During the 1970s, Ghana experienced an annual growth of approximately 20%,



Source: FAO.

Figure 4.1. Ghana: Total NPK Consumption, 1970-90.



Source: FAO.

Figure 4.2. Ghana: Nitrogen, Phosphate, and Potash Consumption, 1970-90.

whereas during the 1980s it experienced an annual decline of 7.6% in fertilizer use (Table 4.1). Consequently, the 1990 fertilizer use level was less than one-half of the level achieved in 1981. Thus Ghana's growth performance in fertilizer use consists of three different phases–acceleration in growth (1970-77), wide fluctuation (1977-84), and near stagnation (1985-91).

Table 4.1. Ghana: Annual Growth in Fertilizer Use, 1960-90

Year	Nitrogen	Phosphate	Potash	Total
		(%)		
1960-70	8.8	22.0	-3.6	8.8
1970-80	20.4	16.5	22.2	20.0
1980-90	-3.9	-8.7	-13.9	-7.6

Source: Derived from FAO data.

As Figure 4.2 suggests, the trends in the use of individual nutrients (N, P_2O_5, and K_2O) are similar to those in the total NPK use. The use of each nutrient increased in the 1970s, decreased in the 1980s, and fluctuated between 1977 and 1981.

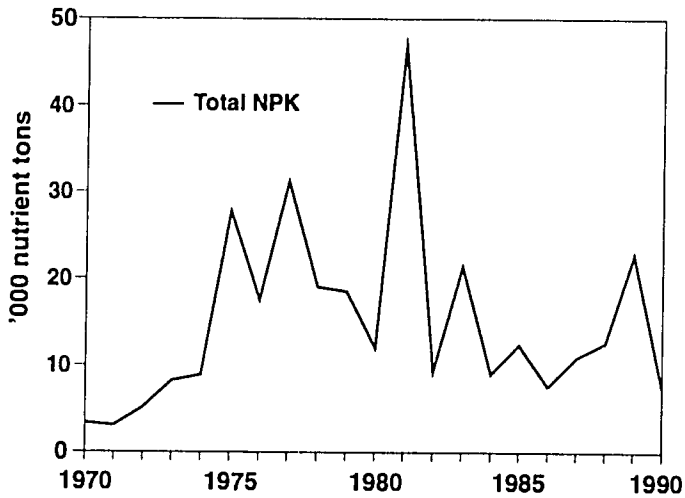
The rapid growth of the 1970s was caused by increased imports, favorable pricing environment, and government commitment to promote fertilizer use. The dramatic decrease in fertilizer use during the 1980s was perhaps caused by the changing pricing and distribution policies and climatic conditions. First, weather conditions were frequently unfavorable. Most of Africa, including Ghana, was hit hard by a severe drought in 1983. The 1983 drought was followed by unfavorable weather in 1986 and 1990. Second, Ghana moved from a fixed exchange rate system to a flexible market-determined exchange rate system. As the fixed exchange rate was highly overvalued, Ghana's exchange rate depreciated rapidly. The value of the U.S. dollar increased from ¢2.8/$ in 1982 to ¢350/$ in 1990. Alternatively, the value of cedi (Ghana's currency) decreased from thirty-six cents per cedi to less than one-third of one U.S. cent per cedi. Such a drastic depreciation (over 12,000%) resulted in increased costs of fertilizer imports and, thereby, increased fertilizer prices for farmers. Third, during the economic recovery program, the Government of Ghana decided to phase out fertilizer subsidies. In 1980, fertilizer subsidies accounted for 60% of the cost of fertilizers. In 1990, fertilizer subsidy was zero. The combined effect of these two changes–exchange rate depreciation and fertilizer subsidy removal–was to increase fertilizer prices by over 250-fold from ¢240/ton to ¢62,000/ton of ammonium sulfate. Such a drastic increase in fertilizer prices also contributed to the declining trend of the 1980s. Fourth, inadequate facilities for credit and crop marketing have also discouraged farmers from using fertilizers. Fluctuations in crop prices added to the decreasing and uncertain profitability of fertilizer use.

4.4 Trends in Fertilizer Imports

Like many sub-Sahara African countries, Ghana has no facilities for domestic production of fertilizer. Hence all of its fertilizer requirements are met through imports. Such exclusive dependence on imports to meet domestic fertilizer requirements introduces several uncertainties. First, the allocation of foreign exchange for fertilizer imports plays a critical role. The untimely and inadequate supply of foreign exchange restricts timely and adequate deliveries of fertilizers to farmers. Second, because foreign exchange is usually scarce and in short supply, fertilizer aid occupies a central role in meeting domestic supply. However, because donors are not willing to commit in advance, fertilizer imports get delayed. Third, fluctuations in world prices and exchange rates add considerable uncertainty to the whole

process. Because of these factors, fertilizer imports in many African countries show wide annual fluctuations (Bumb, 1988). Such wide fluctuations in imports also introduce wide fluctuations in fertilizer use.

Until 1970, Ghana imported modest quantities of fertilizer nutrients (Figure 4.3). In 1970, Ghana's fertilizer imports reached 3,343 tons. Thereafter, Ghana's fertilizer imports accelerated and reached 31,200 tons in 1977. Overall, Ghana's imports increased by 19% per annum during the 1970s (Table 4.2).



Source: FAO.

Figure 4.3. Ghana: Total NPK Imports, 1970-90.

Table 4.2. Ghana: Annual Growth in Fertilizer Imports, 1960-90

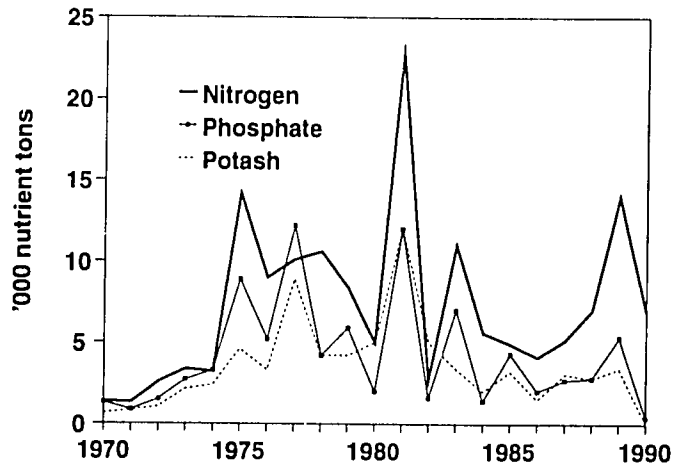
Year	Nitrogen	Phosphate	Potash	Total
		(%)		
1960-70	9.3	21.0	-1.5	9.2
1970-80	19.4	14.7	21.8	19.0
1980-90	0.6	-10.2	-24.4	-5.4

Source: Derived from FAO data.

Like fertilizer use, which itself is a reflection of fertilizer imports, Ghana's fertilizer imports after 1977 decreased rapidly until 1980 but recovered in 1981. One possible explanation for this pattern is that the large quantities of imported fertilizers remained unused in 1977 and led to excessive stocks to be used in later years. This led to decreased imports during the 1978-80 period. Another possibility is that a large amount of donor funds was available to import these fertilizers. Hence the imported fertilizer quantity was a reflection of the availability of foreign exchange.

Fertilizer imports reached a low level of 12,000 tons in 1980 but increased by 290% to 46,800 tons in 1981. Such a rapid increase in fertilizer imports could be a result of several factors–increased governmental commitment and allocation of foreign exchange, donor support, and the need to replenish depleted stocks. As the later developments show, this was Ghana's climax in fertilizer imports.

During the 1980s, fertilizer imports decreased by 5.4% per annum. Except in 1989 when fertilizer imports amounted to 22,700 tons, fertilizer imports during the 1980s remained significantly below the 1981 level. The 1990 fertilizer imports of 7,400 tons were less than one-sixth of the level achieved in 1981. In spite of these low levels of imports, Ghana was building excessive inventories. The Ministry of Agriculture estimates suggest that on September 30, 1990, Ghana's fertilizer stocks were in excess of 65,000 product tons or 26,000 nutrient tons–more than the combined fertilizer use of 1989 and 1990 (IFDC, 1991). Imports of N, P_2O_5, and K_2O also reveal a pattern similar to that of total NPK imports (Figure 4.4).



Source: FAO.

Figure 4.4. Ghana: Nitrogen, Phosphate, and Potash Imports, 1970-90.

The analysis of trends in fertilizer use and imports suggests that the fertilizer market shrank considerably in the 1980s and has stagnated at a low level. Such a small size (average of 10,000 tons of nutrients) has various implications for private sector involvement in fertilizer imports, marketing, and distribution. This also has implications for import costs because Ghana cannot benefit from economies of scale in fertilizer procurements in international markets. Its impact on sustainable crop production and environmental protection is, of course, undesirable.

4.5 Fertilizer Aid

Fertilizer aid plays an important role in fertilizer supplies in Ghana. In 1989 all fertilizers imported in Ghana were financed through donor sources (Table 4.3). The European Economic Community (EEC), the Canadian International Development Agency (CIDA), the Dutch

Government, and the African Development Funds (ADF) were the main donors supplying fertilizers or funds for importing fertilizers to Ghana in 1989. Of 65,000 tons of product, the EEC financed 25,000 tons of product and the Dutch Government 16,000 tons. The ADF provided funds for about 15,000 tons of fertilizer products.

During the 1985-87 period, Ghana's dependence on fertilizer aid varied between 67% and 100%. Such a heavy dependence on donor support is a result of foreign exchange shortages and balance of payment difficulties, although Ghana's dependence on fertilizer aid is in line with that in other West African and sub-Sahara African countries (Tables 4.4 and 4.5). Except Cameroon, most countries in West Africa depended on fertilizer aid to meet more than half of their fertilizer import requirements. Likewise, 27-28 of the 40 sub-Sahara African countries depended on donor support to meet more than 50% of their fertilizer requirements and 20-23 countries depended on such support to meet 100% of their requirements during the 1985-87 period.

Such heavy dependence on donor support introduces several uncertainties in the planning, procurement, and

Table 4.3. Ghana: AID-Financed Fertilizer Imports, 1989

Source/Donor	Total Quantity Imported (tons)	Product	Quantity (tons)	Country of Export	Supplier	c.i.f. Price/ton Tema	Total Cost ('000)
EEC	25,000	15-15-15	8,000	Belgium	Chemimex Europe b.v.	DFL 451.60	DFL 2,556
		20-20-0	8,000	Belgium	Chemimex Europe b.v.	DFL 447.27	DFL 3,578
		AS	9,000	West Germany	D.S.M.	DFL 280.00	DFL 3,613
CIDA	9,500	Urea	6,000	Canada		CDN $329.82	CDN $ 2,017
		MOP	3,500	Canada		CDN $243.30	CDN $ 828
Dutch	16,404	AS	9,711				
		25-15-15	5,913		(Not available)		
		10-20-15	380				
		KNO_3	400	Israel			
ADF	14,500	AS	7,000	West Germany	BASF	DM 231.20	DM 17,815
		20-20-0	7,500				

Source: Ministry of Agriculture, Accra, Ghana, personal communications.

Table 4.4. West Africa: Ratio of Fertilizer Aid to Fertilizer Imports, 1985-87

Country	1985	1986	1987
	---------- (%) ----------		
1. Benin	100	54	26
2. Burkina Faso	100	100	100
3. Cameroon	2	0	0
4. Gambia	100	64	82
5. Ghana	67	100	91
6. Guinea	100	100	100
7. Mali	100	100	100
8. Niger	100	100	100
9. Nigeria	100	100	0
10. Togo	100	100	100

Source: FERTECON (1989).

Table 4.5. Sub-Saharan Africa: Distribution of Countries by the Ratio of Fertilizer Aid to Fertilizer Imports, 1985-87

Ratio (%)	Number of Countries 1985	1986	1987
0	7	8	8
1-20	3	3	4
20-50	2	1	1
50-80	3	3	5
80-99	2	3	2
100	23	22	20
Total	**40**	**40**	**40**

Source: FERTECON (1989).

distribution of fertilizer products. First, many donors are reluctant to provide long-term commitments; hence, the country has to depend on the donor decisions from one year to the other. Second, donor support from bilateral sources is generally tied with several conditionalities. One such conditionality is the rigidity in product choice. The importing country has to buy whatever product is available in the donor country. This generally results in a mismatch of requirements and supplies. Consequently, unsuitable products are often distributed to farmers. Third, such tied aid is often very costly. Prices charged are generally higher than world market prices; hence, farmers are forced to pay higher prices for an unsuitable product. Fourth, excessive dependence on donor support also introduces high fluctuations in fertilizer supplies. Such irregularity discourages farmers from using fertilizers, especially during the learning phase.

One way to improve upon such a situation is to reduce dependence on donor support and provide relatively larger allocation of foreign exchange to import fertilizers. This requires a strong policy commitment. Second, donors should provide relatively higher amounts of untied foreign exchange. In this respect, the importing country should use multilateral agencies to get foreign exchange support for fertilizer imports. Third, the importing country should establish donor coordination committees to coordinate bilateral aid from different sources, and through that committee inform the donors about its requirements. It should make it clear that it will accept only the needed fertilizers and not just any fertilizers.

Why Ghana has allowed itself to depend on donor support for such a critical input needs further exploration and research. Macro and micro factors affecting the financing of fertilizer imports, distribution, and use should be identified in future research.

4.6 Regional Fertilizer Use

Table 4.6 provides data on regional distribution of fertilizer use in Ghana. In order to smooth out annual variations, a 3-year average for the 1988-90 period is calculated to derive regional shares.

Three regions–namely Northern, Upper Eastern, and Upper Western–accounted for about one-half of the total fertilizer use in Ghana during the 1988-90 period. The other three regions–namely Ashanti, Brong Ahafo, and Volta–accounted for about 30%. Thus these six regions account for about 80% of total fertilizer use in Ghana. The southern regions (Eastern, Western, Central, and Greater Accra) account for less than 10% of the total fertilizer use in the country.

This regional distribution of fertilizer use is consistent with the distribution of cereal crops. The northern half of the country produces most of the cereals and also consumes about half of these fertilizers. Compared with this, the southern half of the country is mostly forest region and is devoted

Table 4.6. Ghana: Fertilizer Sales, 1988-90

Region	1988	1989	1990	1988-90 Average	Share
	(product tons)				(%)
Accra (Greater)	522	768	541	610	2.0
Eastern	474	818	331	541	1.8
Central	449	1,703	259	804	2.6
Western	103	294	114	170	0.6
Volta	5,386	4,656	2,586	4,209	13.8
Ashanti	1,843	3,436	2,383	2,554	8.4
Brong Ahafo	1,841	4,546	1,895	2,761	9.1
Northern	7,861	6,578	8,178	7,539	24.8
Upper (Eastern and Western)	7,981	6,439	8,622	7,681	25.3
Unknown[a]	4,511	3,418	2,702	3,544	11.7
Total	30,971	32,656	27,611	30,413	100.0

a. Sales by national depots, donor projects, and private dealers.

Note: Totals may not add due to rounding.

Source: Crop Services Department, Ministry of Agriculture, Accra, Ghana. Unpublished data.

to the tree crops; hence, there is a relatively lower demand for fertilizers in these regions.

This pattern of fertilizer use has several implications. First, Ghana imports most of its fertilizers through the Port of Tema located on the southern tip of the country.[5] Because there are no other production facilities, this port becomes the main source of fertilizer supply. All imported fertilizers have to be transported to Upper and Northern regions. This imbalance between supply sources and demand regions adds considerable cost to fertilizer users in the Upper regions. It was estimated by IFDC (1991) that transportation cost accounts for about 15%-20% of the total delivered cost of fertilizers in Tamale (a regional distribution center in the Northern region). Another 10%-15% is added to the cost for distribution in districts and villages. Second, marketing and distribution channels are relatively well developed in the south and are underdeveloped in the north. Consequently, the country has to make a considerable investment in developing infrastructure and markets in the north. Third, because of location factors, relatively poor farmers living in the north have to pay much higher prices than their southern counterparts. Unless policies are instituted to remedy such natural inequities, the disparity between the north and the south will accentuate and could become a source of political instability. Also, it may discourage growth in fertilizer use in the long run. This issue is discussed in detail in the section on the evolution of the policy environment.

4.7 Fertilizer Use by Crop

No time-series data are available on cropwise fertilizer use in Ghana; hence, this section is based on the cross-section data collected under different farm surveys and the estimates made by an IFDC team in 1991.

On the basis of fertilizer use by product and region, it can be safely concluded that cereals like maize, sorghum, and rice account for a larger share of fertilizer use in Ghana (IFDC, 1991). Although root crops play an important role in providing the national food supply, fertilizer use is minimal (Table 4.7). Likewise, tree crops also account for a small proportion of fertilizer use. In the future, as crop diversification gathers momentum and export promotion accelerates, these crops may account for a larger share of fertilizer use in the country.

4.8 Nutrient Ratio

Table 4.8 provides data on $N:P_2O_5:K_2O$ ratios in Ghana. These ratios indicate units of P_2O_5 and K_2O used per unit of N. In 1970, Ghana's fertilizer use was mostly geared to export/tree crops; hence, phosphate and potash use was relatively higher. In 1970, for two units of nitrogen, farmers were using two units of phosphate and one unit of potash. During the 1970s, this ratio changed and decreased for phosphate and increased for potash. In 1980, for every 10 units of nitrogen, farmers were using 4 units of phosphate and 10 units of potash. Obviously, such high levels of potash were unjustified. Gradually, potash use decreased over time in the 1980s. The prevailing ratio of 1990 reflects the fertilizer needs of food crops. Because most of the fertilizer in Ghana is currently used on food crops, an N:P:K ratio of 1.0:0.35:0.25 would suggest that nutrient use is nearly balanced. Generally, agronomists suggest that a ratio of 2:1:1 is a balanced ratio for most soils. As the Ghanaian soils are rich in potash, they may not need high doses of potash. Also, at low levels of fertilizer use, nitrogen is needed in relatively higher quantities.

The NPK fertilizers are common in Ghana. Because most of the NPK complexes used in Ghana contain all three nutrients, fertilizer use is reasonably balanced in Ghana. A change in N:P:K ratio over time rightly reflects the switch that has taken place in Ghana's agriculture; that is, relatively more fertilizers are used on food crops than on tree crops.

4.9 Fertilizer Products

Table 4.9 provides data on fertilizer imports by products. It is seen from the table that in the 1960s and 1970s, Ghana imported mostly low-analysis fertilizers–like ammonium sulfate (AS) and SSP. This pattern changed in the 1980s when Ghana started importing high-analysis fertilizers like NPK, MOP, and urea, although import of urea was rather recent. Only in 1989 did Ghana start importing urea.

Heavy reliance on low-analysis fertilizers has made fertilizers costly to both farmers and the society (subsidy bill). A move to high-analysis fertilizers will be beneficial to both the society and the farmers.

Because the farmers are accustomed to AS and NPK (15-15-15), a comprehensive seeding and educational program is needed to promote high-analysis fertilizers such as urea and DAP. Also, research and extension facilities should be strengthened. The current emphasis on NPK fertilizers is justifiable and should be promoted, although a move to compounds like 20-20-0 should be encouraged in those areas where soils are not deficient in potash. Recent emphasis on 20-20-0 and 25-15-5 is a desirable move.

Various fertilizer products distributed during 1988-90 are presented in Table 4.10. Fertilizer products distributed in Ghana can be divided into two groups: straight fertilizers and NPK complexes. During 1988-90, straight fertilizers accounted for 47% and NPKs for 53% of all fertilizer products distributed in Ghana. Among straight fertilizers, ammonium sulfate is still the dominant fertilizer. Small quantities of urea were distributed in 1989 and 1990.

5. See Map 1 in Chapter 1.

Table 4.7. Ghana: Acreage Fertilized and Quantity of Fertilizer Used by Crop, 1991 Main Cropping Season

Crop	Acreage Fertilized	Percent	Quantity Used		Percent
			Product	Nutrient	
	(acres)		(kg)		
Cereals	548	72.0	71,112	25,060	80.1
Maize	416	55.0	57,052	19,895	63.6
Millet	20	3.0	1,650	660	2.1
Guinea corn	36	4.0	3,475	1,253	4.0
Rice	76	10.0	8,935	3,252	10.4
Roots and Tubers	14	1.8	475	201	0.6
Cassava	4	0.5	150	68	0.2
Yam	2	0.3	25	10	-
Plantain	8	1.1	300	124	0.4
Oilseed Crops	93	12.2	6,400	2,236	7.1
Oil palm	54	7.1	4,300	1,570	5.0
Coconut	4	0.5	100	45	0.1
Groundnut	35	4.6	2,000	621	2.0
Vegetable Crops	86	11.4	8,940	3,486	11.1
Eggplant	34	4.5	2,825	1,035	3.3
Tomatoes	38	5.0	5,315	2,009	6.4
Pepper	10	1.3	800	319	1.0
Other vegetables	4	0.6	325	123	0.4
Fruit Crops	12	1.6	450	164	0.5
Oranges	4	0.5	350	122	0.4
Pineapple	8	1.1	100	43	0.1
Beans/Cowpeas	6	0.8	251	66	0.2
Cash Crops	2	0.2	250	83	0.3
Cotton	1	0.1	200	61	0.2
Cocoa	1	0.1	50	22	0.1
Total	760	100.0	88,203	31,296	100.0

Source: IFDC/IFPRI/ISSER Fertilizer Policy Project Survey of 108 farmers in six agroecological zones–six farmers from each village and three villages from each zone.

Among NPK complexes, 15-15-15 and 20-20-0 together accounted for more than 40% of all products and 17-17-17 for 5%. The NPK complex 17-17-17 was donated by one country in lieu of 15-15-15.

From this brief description, it is obvious that AS and NPK 15-15-15/20-20-0 are dominant fertilizer products used in Ghana. Whether these products are appropriate for Ghana, from both an economic and agronomic point of view, is discussed later. However, a few comments are in order here.

First, ammonium sulfate is a low-analysis fertilizer. Unless soils are deficient in sulfur, ammonium sulfate is an economically costly fertilizer. The economic cost of nitrogen is much higher through ammonium sulfate than through urea (Figure 4.5); hence, a switch to urea would be a desirable move.

Table 4.8. Ghana: Fertilizer Use, N:P_2O_5: K_2O Ratio, 1970-90

Year	N		P_2O_5		K_2O
1970	1.0	:	1.0	:	0.5
1980	1.0	:	0.4	:	1.0
1990	1.0	:	0.4	:	0.3

Source: Derived from FAO data.

Second, unless soils are deficient in potash, the uniform application of NPKs throughout the country may not be an optimum strategy. Agronomic and soils research suggest that soils in Ghana are not deficient in potash. In such a situation, the use of DAP and compounds like 20-20-0 should be promoted. A switch from existing product patterns to the new desirable one should be properly planned and implemented because considerable learning on the part of farmers will be required to make the switch.

4.10 Trends in Fertilizer Prices

The pricing policy was used in Ghana to keep fertilizer prices low and stable over a long period of time. Consequently, fertilizers were heavily subsidized and fertilizer prices remained stable in the 1970s. However, this policy changed in

Table 4.9. Ghana: Fertilizer Imports, 1954-90

Year	AS	SSP	TSP	MOP	SOP	Urea	15-15-15	20-20-0	5-20-15 10-20-15	DAP/ CAN	3-25-18 2-24-11	Others/ Mixtures	Total
	(tons)												
1954	452	20	29	65	66							42	674
1955	578	89	139	8	41							48	903
1956	1,560	25	56	111	196							95	2,043
1957	208	9	376	4	116							165	875
1958	620	87	66	5	80							115	973
1959	596	124	31	2	247							29	1,029
1960	290	45	210	107	405							257	1,314
1961	633	66	459	275	400							94	1,927
1962	513	47	1,595	25		94	165					455	2,894
1963	3,000	2,500	1,060	600	700							430	8,295
1964	1,000	1,100	192	1,200	300	1,540	1,540					250	7,122
1965	1,800	950	2,477	800		550	950					170	7,697
1966	5,018	275					123					13	5,429
1967	182		6	287			161	13					649
1968	150	150					2,000	900					3,200
1969	1,210	2,300	510	225			500	510					5,255
1970	3,140	97	72	38	11	3	3,671	1,087	124			7	8,250
1971	1,943	460	21	179	92	3	4,923	544	159			302	8,626
1972	3,852	287	88	33	137	33	5,787	2,085				5	12,307
1973	8,100	1,500	300	200	48	8	14,278	3,418	930		1,000		16,931
1974	4,150	800	200	10		10	6,000	1,000			300		12,470
1975	2,258	1,025	900	5		3	16,075	1,475	500				22,241
1976	2,557	582					36,626	4,218					43,983
1977	2,900	6,700	780	70	10		4,200	4,000	3,000	4,300	240	350	26,550
1978	13,739						15,896	6,180		1,545		2,000	39,360
1979	19,000						39,650						58,650
1980	17,980		400	500			39,600		500	1,480			60,460
1981													
1982	14,000						20,000	8,000	500	4,000			46,500
1983													
1984	13,600					200	24,550						38,350
1985	5,437						21,362	3,200					29,999
1986	8,500	400		1,000				9,600	600				20,100
1987	14,650			600			4,800	17,620	400				38,070
1988	20,550			1,050			9,400	3,300	600			5,075[a]	39,575
1989	25,711			3,340		6,015	8,000	15,500	380			6,293[b]	65,239
1990	2,000		500			20,100	4,250	8,500				9,000[c]	44,350

a. 17-17-17.
b. 5,893 tons of 25-15-5/23-15-5 and 400 tons of potassium nitrate.
c. 9,000 tons of 25-15-5/23-15-5.

Source: Crop Services Department, Ministry of Agriculture. Unpublished data.

Table 4.10. Ghana: Fertilizer Use by Products, 1988-90

Product	1988	1989	1990	1988-90 Average	% Share
			(tons)		
Straight Fertilizers					
Ammonium sulfate	12,349	13,047	8,292	11,229	38
Urea	0	2,094	3,001	1,698	6
Muriate of potash	1,067	195	972	745	3
Others[a]	0	72	32	35	-[b]
NPK Complexes					
15-15-15	6,819	7,223	4,091	6,044	21
20-20-0	7,700	8,001	3,859	6,520	22
17-17-17	2,486	1,537	295	1,439	5
Others[c]	543	104	4,653	1,767	5
Total	30,964	32,273	25,195	29,477	100

a. Includes small quantities of potassium nitrate and SSP.
b. Insignificant.
c. Includes 25-15-5 and 12-20-15.
Source: IFDC (1991).

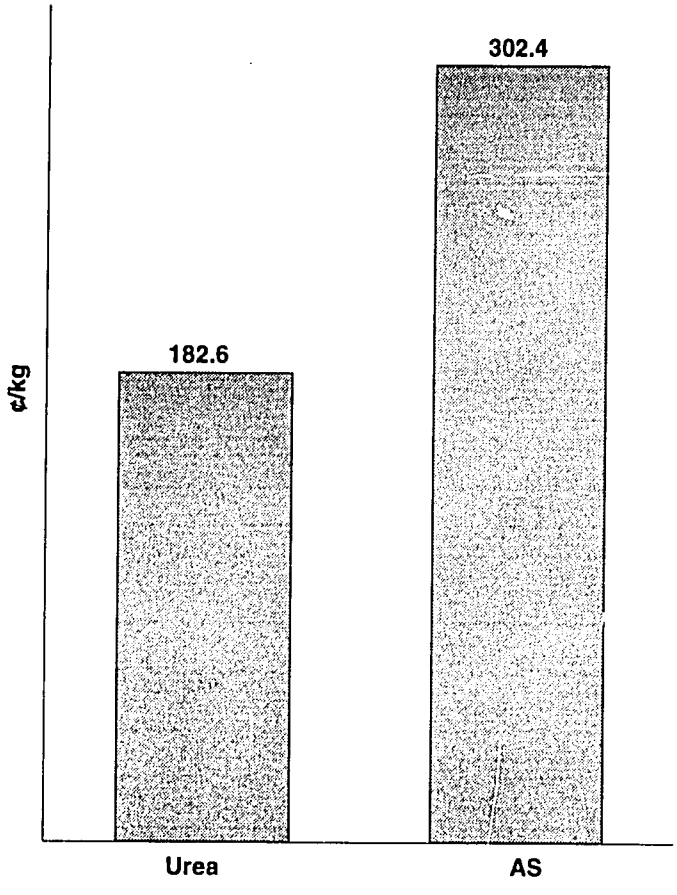


Figure 4.5. Ghana: Price of Nitrogen Through Urea and Ammonium Sulfate, 1990.

the 1980s, and fertilizer prices increased rapidly (Table 4.11). Prices indicated in this table are nominal fertilizer prices. Trends in real fertilizer prices are discussed in the next section.

During the 1970-75 period, fertilizer prices were constant at a low level of ¢2-3/bag. In 1977, prices of both ammonium sulfate and NPK (15-15-15) were increased by about 130%-150%. The 1977 price increase was followed by several upward adjustments in prices in the late 1970s. Consequently, fertilizer prices were five to six times higher in 1980 than they were in 1976. These adjustments in prices were reflections of increased costs of fertilizer imports, which themselves were a result of the energy crises of the mid- and late-1970s. In spite of a sixfold increase in fertilizer prices, fertilizer prices remained heavily subsidized in Ghana. In 1980, the average subsidy on fertilizers was about 65%.

The 1980s saw several drastic adjustments in fertilizer prices. Ammonium sulfate prices increased from ¢12/bag in 1980 to ¢295/bag in 1984, ¢1,600 in 1988, and ¢3,100/bag in 1990. NPK (15-15-15) price also increased from ¢15/bag to ¢4,200/bag during the same period. The price increases of the 1980s were more than 25,000% or over 250-fold.

These changes were a result of several factors. First, under the economic recovery program, the value of the cedi was allowed to depreciate and attain a market-determined rate. Consequently, the value of the cedi changed from ¢2.8/US $1.00 in 1980 to ¢350/US $1.00 in 1990. This depreciation of the cedi led to an increase in the cost of all imported products, including fertilizers; hence, to reflect these increased import costs, fertilizer prices were adjusted rapidly, which led to the observed severalfold increase. Second,

Table 4.11. Ghana: Fertilizer Prices and Subsidy Rate, 1970-90[a]

Year	Ammonium Sulfate (¢/50-kg bag)	NPK 15-15-15 (¢/50-kg bag)	Subsidy Rate (%)
1970	2.0	2.8	
1971	2.0	2.8	
1972	2.0	2.8	
1973	2.0	2.8	
1974	2.0	2.8	
1975	2.0	2.8	
1976	2.0	2.8	
1977	5.0	6.5	
1978	6.0	7.5	
1979	8.5	10.0	80
1980	12.0	15.0	65
1981	25.0	30.0	45
1982	25.0	30.0	45
1983	45.0	58.0	45
1984	295.0	440.0	45
1985	295.0	440.0	59
1986	490.0	780.0	36
1987	820.0	1,380.0	42
1988	1,600.0	2,300.0	30
1989	2,350.0	3,350.0	15
1990	3,100.0	4,200.0	0

a. Refers to nominal prices in current ¢.

Source: Ministry of Agriculture, Accra, Ghana.

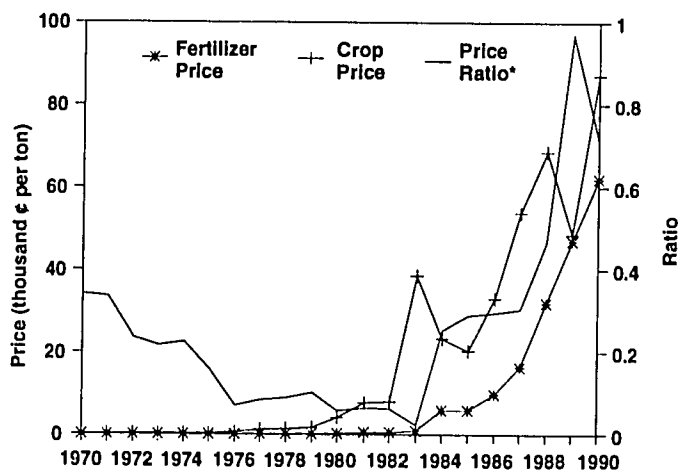
under ERP, several policy changes were introduced. Some of these changes affected the fertilizer sector adversely. One such change was the change in the pricing policy. The earlier pricing policy favored heavy subsidization of fertilizers; however, the ERP policy was to phase out all subsidies including those on fertilizers. Hence, fertilizer subsidies were gradually reduced from 65% in 1980 to 0% in 1990. This change in policy also led to increased fertilizer prices. It should be mentioned that, although nominal subsidies were reduced to zero in 1990, there were many implicit subsidies consisting of charges on capital, storage, and transportation. These implicit subsidies were in the range of 25%-35% (IFDC, 1991).

4.11 Crop and Fertilizer Prices

Because of the reduction in fertilizer subsidies and the depreciation in the value of local currency (cedi), fertilizer prices increased severalfold in the 1980s. However, such an increase in the absolute price of an input like fertilizer does not reveal the real cost of fertilizer to the farmer because of changes in crop prices. Hence, fertilizer and crop prices are compared in Figure 4.6 to analyze trends in real prices of fertilizers. Figure 4.6 also provides information about the ratio of fertilizer (AS) price to crop (maize) price.

On the basis of the information in Figure 4.6, several observations can be made about fertilizer and crop prices and real cost of fertilizers in Ghana. First, both crop and fertilizer prices increased rapidly during the 1970-90 period. Crop prices and fertilizer prices were higher by about 74,000% and 155,000%, respectively, in 1990 over the 1970 level. Second, crop prices increased more rapidly than fertilizer prices in the 1970s, whereas fertilizer prices increased more rapidly than crop prices in the 1980s. Consequently, the real cost of fertilizers decreased significantly in the 1970s and increased substantially in the 1980s. Third, crop prices fluctuated from one year to the other, whereas fertilizer prices do not show any fluctuations. The fluctuations in crop prices introduce uncertainty in the profitability of fertilizer use.

Like fertilizer prices, crop prices also increased rapidly during the 1980s. For example, a ton of maize was sold for ¢4,138 in 1980, whereas the same ton of maize was sold for ¢87,110 in 1990–over 20-fold increase. Such an increase



*Fertilizer Price to Crop Price.

Note: The prices are for ammonium sulfate and maize.

Figure 4.6. Ghana: Fertilizer and Crop Prices, 1970-90.

in maize prices compensated farmers for increases in fertilizer prices. However, this 20-fold increase in maize prices was overshadowed by over 250-fold increase in fertilizer prices. Thus, in relative terms, fertilizers were much costlier in 1990 than they were in 1980.

During the 1970-90 period, the real cost of fertilizer changed significantly. In 1970 a farmer could buy three bags of ammonium sulfate for one bag of maize (Figure 4.7A). Because crop prices increased more rapidly than fertilizer prices in the 1970s, the farmer could buy 16-2/3 bags of ammonium sulfate for the same bag of maize in 1980. Thus, between 1970 and 1980, the real cost of fertilizer decreased by 82%. Alternatively, the farmer's

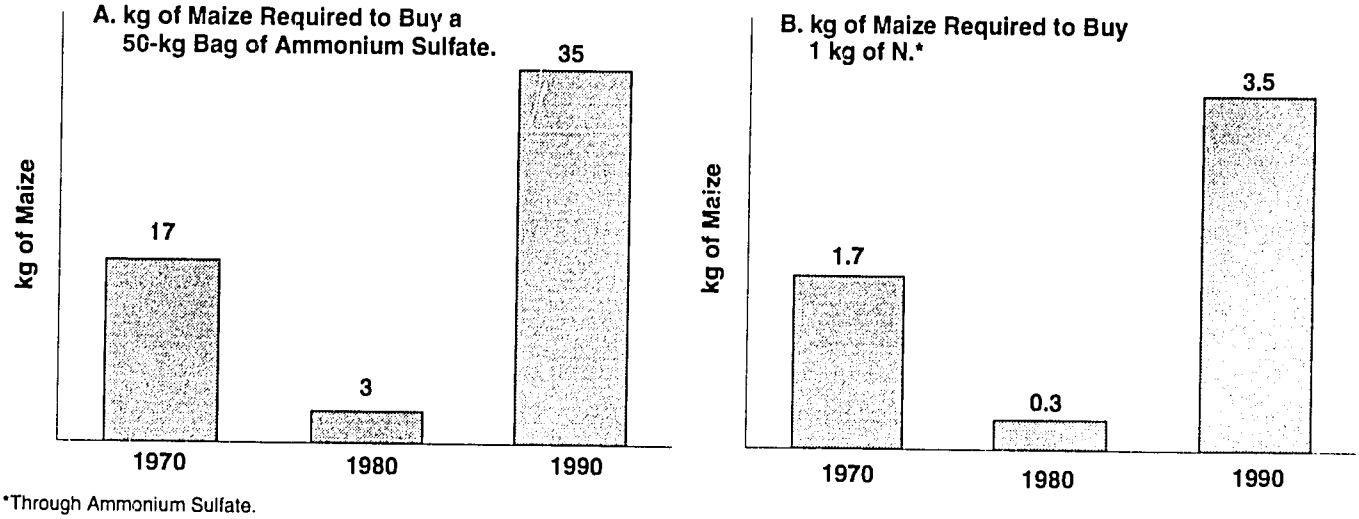
capacity to purchase fertilizers increased by over fivefold. This gain in purchasing capacity was wiped out in the 1980s. In 1990 a farmer could buy less than 1 bag of ammonium sulfate for the same bag of maize. The real cost of fertilizers increased by about 12-fold between 1980 and 1990.

The real price of N through ammonium sulfate reveals a similar pattern. It changed from 1.7 kg (kilogram of maize per kilogram of N) in 1970 to 0.3 kg in 1980 and 3.5 kg in 1990 (Figure 4.7B). This increase in real costs of fertilizers definitely reduced relative profitability of fertilizer use and contributed to the declining trends in fertilizer use in the 1980s. Uncertainty resulting from fluctuations in crop prices also affected profitability of fertilizer use and perhaps contributed to a decrease in fertilizer use.

Whether the prevailing pricing environment in 1990 was favorable in absolute terms, i.e., the prevailing crop and fertilizer prices made fertilizer use profitable in 1990, is analyzed in Chapter 6.

4.12 Marketing and Distribution

The privatization of the supply and distribution of fertilizer in Ghana was meant to bring fertilizer to the doorstep of farmers. However, many farmers still complain about availability of fertilizer in their localities. Very few dealers actually lifted fertilizer from the national depots for distribution in the districts (Table 4.12). The dealers complained of low margins when compared with other alternatives like selling rice and sugar.



*Through Ammonium Sulfate.

Figure 4.7. Ghana: Real Price of Fertilizers–1970, 1980, and 1990.

Table 4.12. Fertilizer Privatization Program–Registrants and Active Dealers

Region	1989		1990	
	Number of Registrants	Number of Active Dealers	Number of Registrants	Number of Active Dealers
Western	7	-	7	1
Central	8	-	18	2
Greater Accra	9	-	23	3
Eastern	12	-	26	-
Volta	55	1	65	1
Ashanti	10	1	41	12
Brong Ahafo	86	8	107	14
Northern[a]	103	1	286	14
Upper West[a]	24	1	34	1
Upper East[a]	37	1	49	1

a. Also served by Farmers Services Company (FASCOM).

Source: Ministry of Agriculture.

Chapter 5
The Policy Environment: An Analytical Framework

5.1 Introduction

Efficient, equitable, and environmentally safe fertilizer use depends not only on sound agronomic practices and appropriate fertilizer products but also on the existence of a conducive policy environment. Inappropriate policies have resulted in inefficient fertilizer use and environmental degradation and/or loss in crop production and farm incomes in many developing countries. Nonconducive policy environment in many African countries has kept fertilizer use rather low. In other countries, excessive farm subsidies have led to misuse of fertilizer products and environmental pollution. Likewise, poor quality control and environmental standards have created environmental pollution in several locations where fertilizers are produced.

The experiences of South America and South Asia in the 1980s clearly explain the role of a conducive and stable policy environment in promoting growth in fertilizer use (Figure 5.1).

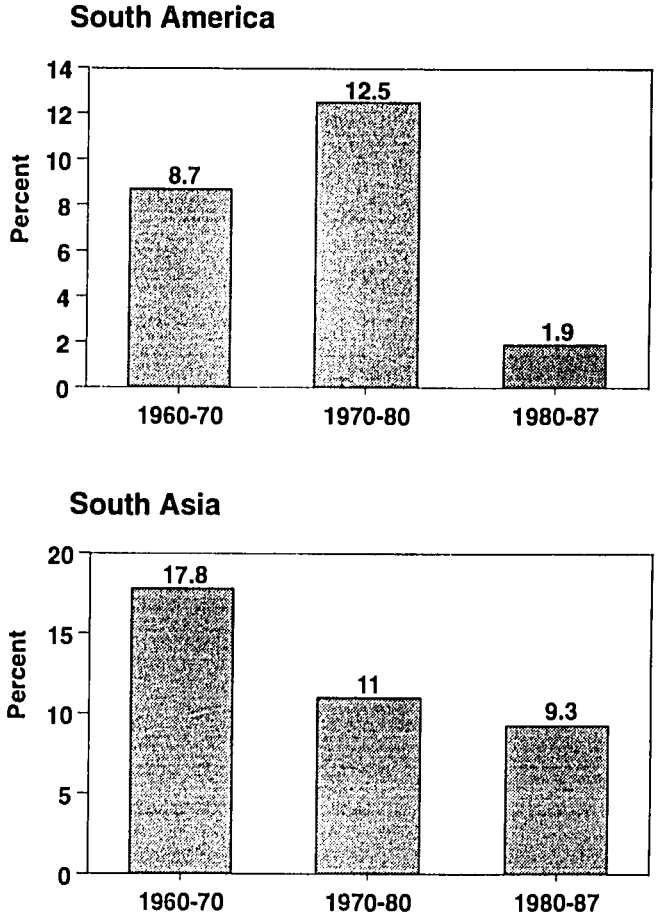
In the 1980s, South America experienced several policy shocks–debt crisis, foreign exchange shortages, removal of fertilizer subsidies in Venezuela and subsidized credit in Brazil, and low crop prices for many agricultural export commodities. Consequently, fertilizer use grew by less than 2% per annum as against 12.5% per annum in the 1970s. In contrast, South Asian countries maintained a stable and conducive policy environment for their fertilizer and agricultural sectors. Foreign exchange shortages were not allowed to affect fertilizer sector operations, nor were any policy shocks introduced. As a result, fertilizer use continued to grow at a high rate of 9.3% per annum in the 1980s.

Various policies affect the development of the fertilizer sector operations in the developing countries. The theory and practice of policy analysis, formulation, and implementation suggest that the selected components of the following policies have relatively more influence on the fertilizer sector operations. Hence, these policies are selected for an in-depth analysis and evaluation:

1. Macroeconomic Policy.
2. Pricing and Subsidy Policy.
3. Organizational Policy.
4. Supply Policy.
5. Credit Policy.
6. Research and Extension Policy.
7. Environmental Policy.

5.2 Macroeconomic Policy

Three components of macroeconomic policy have relatively more impact on the fertilizer sector operations:



Source: Derived from FAO data.

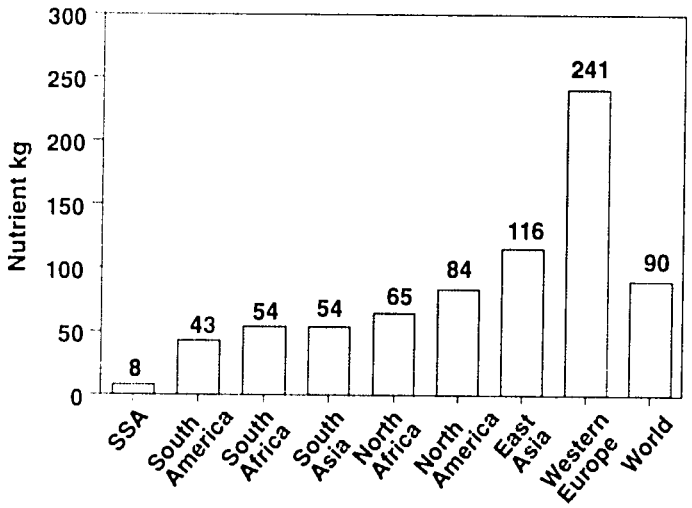
Figure 5.1. Annual Growth in Fertilizer (NPK) Use, 1960-87.

1. Foreign exchange allocation.
2. Exchange rate fluctuations.
3. Import restrictions.

5.2.1 Foreign Exchange Allocation–Untimely and inadequate allocation of foreign exchange adversely affects fertilizer use, production, and imports. Many developing countries do not have domestic capacity to produce all fertilizer products required for crop production. Even those countries who are endowed with raw materials or feedstocks need foreign exchange to import the necessary plant, equipment, and technical know-how to convert raw materials into domestic production capacity. Furthermore, fertilizer production technologies are highly capital and foreign exchange intensive. For example, an ammonia-urea plant with a capacity of 1,000 tpd of ammonia and 1,500 tpd of urea costs anywhere between US $400 million and US $600 million of investment.

Thus, for many developing countries, the availability of foreign exchange becomes critically important for import of finished products and raw materials for domestic production.

In many African countries, shortages of foreign exchange and debt crises have restricted fertilizer use to rather low levels (Figure 5.2). In 1987, 20 of 40 sub-Sahara African countries used fertilizers only because these were available from donor-assisted sources either as grants or as loans.[6] Likewise, debt crises and foreign exchange shortages affected fertilizer use in South American countries.



Source: FAO.

Figure 5.2. Fertilizer Use Per Hectare, 1988.

The lack of foreign exchange affects not only fertilizer use but also domestic capacity utilization. In both Tanzania and Zambia, inadequate and untimely supply of foreign exchange prevented import of necessary raw materials and spare parts to operate fertilizer plants. Consequently, plants produced far below their capacity.

Thus, it is crucial that foreign exchange be allocated on time and in adequate quantities so that farmers can get fertilizers on time and producers do not underuse their productive capacity.

In the allocation of foreign exchange, one point needs stressing. Many governments are hesitant in allocating foreign exchange for import of fertilizers or raw materials and spares for fertilizer production because it is treated as an "expenditure" item and not as an "investment" item. It must be stressed that foreign exchange allocated to fertilizers should be treated as an investment item because foreign exchange spent on import of fertilizers results in savings of foreign exchange by import substitution and export promotion of agricultural products. In 1990, US $1 spent on fertilizer imports could have saved and/or generated US $3-$7 in the developing countries.

6. See Table 4.5 in Chapter 4 for details.

5.2.2 Exchange Rate Fluctuations–In the 1960s and 1970s, many developing countries pursued a policy of a fixed exchange rate. Consequently, the exchange rate was generally stable, and therefore the price of imported fertilizers did not change in short and medium terms. Occasionally, these economies devalued their currencies to restore balance in their trade and capital accounts. However, in the 1980s, many countries moved to a flexible exchange rate system. Consequently, the exchange rate has depreciated significantly. For example, in 1982, Ghana's exchange rate was US $1 = ¢2.8. In 1990, under the free and flexible exchange rate system, this increased to US $1 = ¢350. Likewise, Nigeria's exchange rate changed from US $1 = N1 in 1985 to US $1 = N12 in 1990. Such depreciations of domestic currency led to astronomical increases in domestic prices of imported fertilizer products. For example, in Ghana, the price of ammonium sulfate increased from ¢500/ton in 1983 to ¢62,000/ton in 1990.

Unless such increases are compensated by increases in crop prices and provisions for credit, these changes reduce incentives to use fertilizers. Under such circumstances, a phased and short-term program of subsidies may be desirable. Otherwise, it may lead to an irreversible decrease in fertilizer use and thereby in food and nonfood crop production. Policymakers have to safeguard against such shocks.

5.2.3 Import Restrictions–Many countries have restricted imports of foreign goods and services for good reasons: mainly, to promote and protect domestic infant industries. However, such restrictive policies have protected inefficient industries. Consequently, either farmers or taxpayers or both have to suffer and bear the burden of such inefficiencies.

Many studies indicate that tariffs are relatively more efficient than quotas for promoting domestic industrialization. The World Bank allows 15% protection for domestic industries. The optimal rate of protection differs from one country to another. However, policymakers should ensure that protection for inefficient (domestic) industries is not long lasting. Further, policymakers can use imports to create gentle pressure on domestic producers to improve their efficiency.

5.3 Pricing and Subsidy Policy

The main objective of a pricing policy is to provide incentives for efficient fertilizer use. In this arena, both crop and fertilizer prices are important. Another objective of the pricing policy is to provide a stable pricing environment so that fluctuations in prices and profitability of fertilizer use are minimized. High price fluctuations may produce cyclical investment and production behavior leading to excessive surpluses or deficits in crop markets and thereby

reduced incentives for adoption of new technologies including fertilizer use. In many African and Latin American countries, the lack of a stable and remunerative pricing environment discouraged fertilizer use in the 1980s.

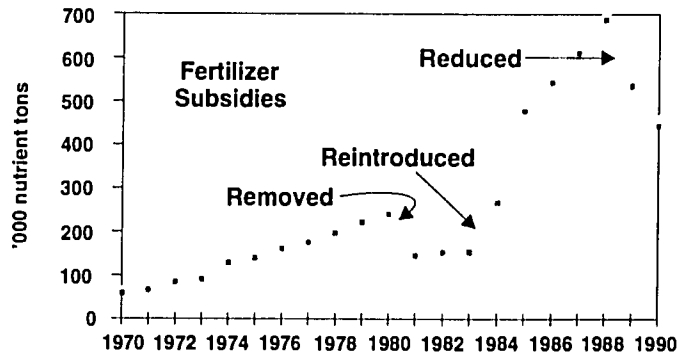
Another issue in this area is the issue of fertilizer subsidy. The challenge here is to determine the optimum level of fertilizer subsidies so that food security may not be impaired. Because fertilizer and farm subsidies ultimately create fiscal burdens and become unsustainable, a critical evaluation of this policy is necessary. However, it must be stressed that the pricing and subsidy policy must be evaluated in the dynamic context of changing social, political, and economic goals.

Most of the developing countries have made use of input subsidies. In a survey of 38 developing countries, FAO reported that 68% used fertilizer subsidies. Most developing countries used fertilizer subsidies to prevent the 1974/75 explosion of international prices from being reflected in the domestic prices and thereby prevented a deterioration in the cereals-fertilizer price ratio.

An analysis of fertilizer subsidies in developing countries for 1980-86 revealed that the region with the largest number of countries without fertilizer subsidies was Latin America. The Asian region had the largest number of countries with subsidies. Average growth rates of fertilizer consumption were twice as high in those countries as in those without subsidies. In the other regions, on the average, the countries with subsidies had positive growth rates, whereas fertilizer consumption declined in countries without subsidies (Couston and Narayan, 1987). However, the difference in the average fertilizer consumption growth rates should not be attributed entirely to crop-fertilizer price relationships. Adequacy of supply, timely distribution of fertilizers, and the efficiency of the crop marketing system also influence the use of fertilizers.

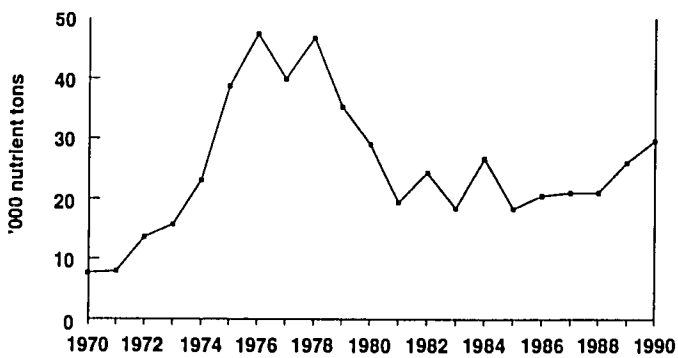
The main argument against subsidies is that their use encourages wasteful and misdirected use of resources in that the prices no longer reflect real costs. Input subsidies, therefore, are generally considered less efficient than higher produce prices as a means of increasing output. However, fertilizer subsidies are more effective than produce price increases in raising the real incomes of small farmers with limited marketable surplus. Input subsidies have been widely used to maintain reasonable domestic price stability during periods of large increases in the prices of imported inputs. They have also been used to correct distortions in relative prices by providing incentive price-cost ratios.

Not only is an evaluation of the subsidy policy important, but also proper sequencing and phasing are required for introducing changes in the policy environment. Ad hoc policy changes may become counterproductive and unsustainable and therefore may require policy reversals. On the other hand, well-managed and properly phased policy reforms not only are sustainable but also contribute to increased crop production and farm incomes through increased fertilizer use. IFDC-managed and -implemented institutional and policy reforms in Bangladesh provide an example. Unlike the situation in Senegal and Venezuela, where the removal of fertilizer subsidies led to decreased fertilizer use, in Bangladesh the removal of fertilizer subsidies led to decreased fertilizer prices and increased fertilizer use (Figures 5.3-5.5). This result was achieved by



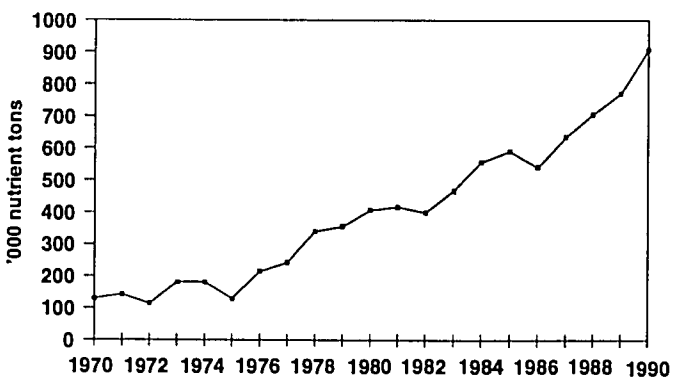
Source: FAO.

Figure 5.3. Fertilizer Use in Venezuela, 1970-90.



Source: FAO.

Figure 5.4. Fertilizer Use in Senegal, 1970-90.



Source: FAO.

Figure 5.5. Fertilizer Use in Bangladesh, 1970-90.

synchronizing the subsidy removal programs with the development of a competitive market system, which promoted increased efficiency and decreased costs in marketing and distribution of fertilizer products.

In addition to crop and fertilizer prices, policymakers also have to decide about prices of raw materials like natural gas, fuel oil, electricity, phosphate rock, and others.

Plentiful availability of a certain feedstock, such as natural gas or phosphate rock, may allow policymakers to set prices rather low, sometimes below their economic costs. Economists recommend that prices of nonrenewable resources be set at their opportunity cost, that is, either at the price at which they could be imported or at their competitive use-level prices. For example, if cement and cotton textile industries can pay higher prices than import parity price, then other industries, like fertilizer industries, should also pay high prices. On the other hand, if the country is an exporter of raw materials, then domestic industry should be charged an export-parity equivalent price. Prolonged subsidization of domestic industries may lead to wasteful use of raw materials. For example, excessively low prices for natural gas in Algeria's fertilizer sector have resulted in high energy use for ammonia production.

National goals like food security, agricultural growth, regional development, and foreign exchange earnings will have an important bearing on determining raw material prices for the fertilizer industry. However, one thing is certain: Prices should not be kept either so low or so high that they encourage suboptimal use of resources. A proper social cost-benefit analysis should be done to evaluate the efficiency of this policy.

5.4 Supply Policy

The main objective of the supply policy is to provide fertilizers to farmers at the lowest cost possible, through either domestic production or import or both.

In order to achieve relatively greater fertilizer security, many developing countries have strived to achieve fertilizer self-sufficiency, sometimes at a very high cost. If the country has plentiful natural gas, or other raw materials, it can invest in fertilizer production facilities. However, in some countries, developmental costs of raw materials may outweigh the advantage gained by domestic production. For example, the cost of fertilizer production in Tanzania was two times more than the import cost although natural gas was locally available. Consequently, the country could not find financial resources to implement that project. Likewise, a naphtha-based plant in Madagascar was built, but it never operated because domestic cost was much higher than import cost.

In the field of fertilizer production, one simple rule to follow is this: If a country does not possess any raw materials, do not build a plant based on imported raw materials. Even if the country has one of the two or three raw materials needed to make fertilizers, it should be very cautious so that it does not end up with a "white elephant," as Sri Lanka and Madagascar did.

Another consideration is the size of market. Many countries in Africa have a rather small market (Table 5.1); modern technologies, however, require large-scale production to reap the benefits of economies of scale. If the domestic market is small, the country should explore opportunities for exports so that the plant operations are financially and economically viable.

Table 5.1. Sub-Saharan Africa: Size Distribution of Fertilizer Use, 1987/88

Size ('000 nutrient tons)	Number of Countries
Less than 5	17
5-10	5
10-20	6
20-50	7
50-100	3
More than 100	2
Total	40

Source: FAO.

Sometimes, some large countries have built plants that were not economically justifiable but were strategically desirable. Countries like India, China, Mexico, and Brazil have used this argument because their total dependence on international markets was perceived to be too risky for national food security. Such considerations, although desirable, should be kept to a minimum.

Because many countries do not have all the raw materials needed for fertilizer production, import policy should be designed to complement domestic production and supply. The success of import policy is dependent on a conducive macroeconomic policy. Adequate and timely supply of foreign exchange is critical for importing fertilizers on time and in adequate quantities.

Last, supply policy should also promote use of domestic agrominerals. This could become a source of foreign exchange savings, provided cheap and subsidized fertilizers are not dumped in the market. However, the cost of development of mines and other infrastructure to facilitate the use of agrominerals should not be overlooked.

5.5 Credit Policy

Many developing countries have favored a cheap credit policy. That is, interest charged on borrowed capital/loans was kept low, especially for agriculture and fertilizers. In

some cases, such rates were negative because the inflation rate was higher than the interest rate.

Evidence from many World Bank and other donor-financed projects suggests that keeping interest rates low promotes either misuse or diversion of funds; money borrowed for purchasing fertilizers or digging wells ends up being spent on other purposes.

Two aspects of credit policy merit special attention for fertilizer sector development: first, interest rates and second, availability of funds.

Evidence from several developing countries suggests that interest rates should not be kept very low. Developing financial markets and increasing the supply of funds are better ways of keeping interest rates at affordable levels rather than subsidizing them. However, because of inherent risks and uncertainty in crop production, a small differential may be desirable; the degree of such differential will differ from country to country due to differences in ecological, technological, institutional, and infrastructural conditions.

The availability of funds for purchase of fertilizers has to be ensured through some special arrangements. Here, two aspects should be kept in consideration: first, availability of funds for farmers and second, availability of funds for fertilizer dealers.

Many programs have been designed to help farmers to borrow credit for fertilizer purchase and other agricultural needs. Loan recovery had always been a problem unless such loans were tied to crop purchase. Politicalization of lending institutions has led to relatively higher loan defaults. Proper management and discipline in assessing loan requirements and seeking adequate collateral may minimize such problems. Also, the problem is psychological. Many farmers feel that the government loans are grants. Hence, they never plan for repayment. Informing farmers about such issues can also help.

Because of government monopoly in fertilizer marketing and distribution, private dealers rarely participated in fertilizer marketing, although they were always involved in the distribution of pesticides and other chemicals. Now, as many countries are privatizing their fertilizer sector operations, ensuring adequate credit for private dealers has become an important issue. Policymakers have to keep two points in mind here.

First, many of these dealers are retailers who have had little experience in dealing with banks. Hence, the banks do not lend them money. Also, the dealers have little to offer as collateral. Thus, the concept of warehousing collateral has to be popularized. Both bankers and dealers have to be educated about this concept. Under such schemes, fertilizer stocks in the warehouse are treated as collateral for bank funds, and a small quantity of fertilizer is issued to the dealer. As this quantity is sold, the dealer exchanges cash received from the sale of the first installment for the next shipment of fertilizers. Thus, once the flow of funds is established, the dealer has the ease of trading funds for fertilizers and is not constrained by lack of funds in trading activities.

Second, in the transition phase, the national government may have to provide some type of credit guarantee for these dealers so the bankers will be willing to risk their funds.

5.6 Organizational Policy

Many developing country governments have created monopolies for fertilizer import, production, and distribution. At the initial stage of development, when fertilizer products are new and the fertilizer market is small, the direct involvement of governmental agencies may be desirable. However, when the market is fully developed, the continued presence of the government in marketing and distribution of fertilizers may become counterproductive. For example, in one African country, farmers have to travel 18 miles to buy a bag of fertilizer. Furthermore, because the governmental depot is open only on a limited number of days and hours in a week/month, many farmers have to make several trips to buy even one bag (50 kg) of fertilizer products. Such marketing arrangements discourage fertilizer use and prevent potential increases in crop production and farm incomes.

A competitive marketing system eliminates these inefficiencies and provides fertilizers at a lower cost and on time, as has happened in Bangladesh. To quote the *Bangladesh Times:*

> Fertilizer sales increase by 20 percent.... Farm-level prices of fertilizer fell by at least 10 percent in 1989/90 over the previous year due to increased role of private sector in distribution and marketing.

Likewise, efficient organizational arrangements are also needed for fertilizer imports and production. However, because of economies of scale and foreign exchange requirements, the type and size of viable organizations for these activities may differ from those for marketing and distribution. A proper analysis of the country's needs, resources, and level of development is required to identify viable and sustainable organizations for various domains of the fertilizer sectors in the developing countries. The government policy should actively encourage the development of competitive markets and private sector agencies in dealing with the fertilizer imports, marketing, and distribution.

5.7 Environmental Policy

The lack of proper policy in this area has led to soil degradation, deforestation, and desertification in many developing countries, and pollution of land, air, and water in the developed countries. Unless proper measures are developed and appropriate policies are introduced, the latter

environmental problems may also affect many developing countries. The identification and promotion of environmentally safe fertilizer practices and products are thus essential to achieve multiple objectives of food security, clean environment, and sustainable resource base.

In formulating environmental policy and assessing its impact on fertilizer use and supply, two aspects should be kept in mind: First, what is the role efficient fertilizer use can play in preventing soil degradation resulting from the depletion of plant nutrients? Second, what are the chemical pollutants associated with fertilizer use? Nitrate leaching, eutrophication, and nitrous oxides are some problems that must be controlled. Considerable research is needed to formulate appropriate policies in this area because adequate information is lacking.

The environmental impact of fertilizer use is confounded by the environmental impacts of other nutrient sources, such as animal manure, legumes, and nutrient reserves in the soil. Thus, it is crucial that appropriate programs be developed to measure the impact of each source and suitable policies be introduced to mitigate undesirable effects.

5.8 Research and Extension Policy

Efficient and environmentally sound fertilizer use requires adequate institutional capacity in research and extension. Without adequate research and extension, fertilizer may be used improperly. Inappropriate fertilizer products may be distributed to farmers. Likewise, without proper soil and crop analysis, farmers may use wrong products. For example, acidic soils may require heavy doses of lime before nitrogen and phosphate fertilizers become productive.

Many developing countries do not have adequate capacity for research and extension; they also do not establish proper coordination between research and extension. Consequently, many research findings never get translated into farmer recommendations, and many extension recommendations never have adequate research support. Hence, adequate funding should be provided for research and extension, and proper coordination should be established between research and extension.

Chapter 6
Evolution and Evaluation of the Policy Environment

6.1 Introduction

In Chapter 5, various components of different macro- and microeconomic policies, sectoral policies, and environmental policies have been identified in an analytical and empirical way. In this chapter, the evolution of Ghana's policy environment consisting of the policies mentioned in Chapter 5 is pursued. Also, these policies are assessed in terms of their impact on fertilizer use, supply, prices, and other indicators. However, because adequate and reliable information could not be obtained about research and extension and environmental policies, these two policies are not included.

6.2 Macroeconomic Policy

Three components of macroeconomic policy, namely, allocation of foreign exchange, exchange rate policy, and import controls, are analyzed below.

6.2.1 Allocation of Foreign Exchange–The allocation of foreign exchange for importing fertilizer should be analyzed from three different angles. First, was the quantity of foreign exchange allocated adequate and timely? Second, what were the institutional arrangements for allocating foreign exchange? Third, what role did donors play in providing foreign exchange for fertilizer imports?

In addition to these three angles, one should also remember that in 1988 Ghana introduced foreign exchange (Forex) bureaus, which were allowed to deal in foreign exchange transactions. Hence, the pre-1988 period should be treated differently from the post-1988 period.

Because the Ministry of Agriculture had full responsibility for estimating fertilizer requirements, procuring fertilizers from abroad, and distributing them among different regions, the MOA had to approach the Ministry of Finance for allocating foreign exchange for fertilizer imports.

From our discussions with the MOA officials, it was clear that no separate allocations were made for fertilizer imports during the 1970s; if allocations were made, no records were available. Hence, many observations made about this subject are based on indirect evidence.

While completing its study in 1986, IFDC tried to trace through the arrangements for foreign exchange allocation. The IFDC study concluded that foreign exchange for importing fertilizers was available through an International Development Agency (IDA) credit. However, the Ministry of Finance rarely approved the release of foreign exchange on time. This resulted in considerable delays in procuring fertilizers on time. As a result, fertilizers arrived at the port after the main season had already begun and therefore could not be distributed to farmers when they needed them most–at the planting time (IFDC, 1986).

Ghana's excessive dependence on donor support for fertilizer imports would also suggest that the allocation of foreign exchange in adequate quantity and on time usually constrained fertilizer supplies and therefore use in Ghana in the 1970s and the early 1980s.

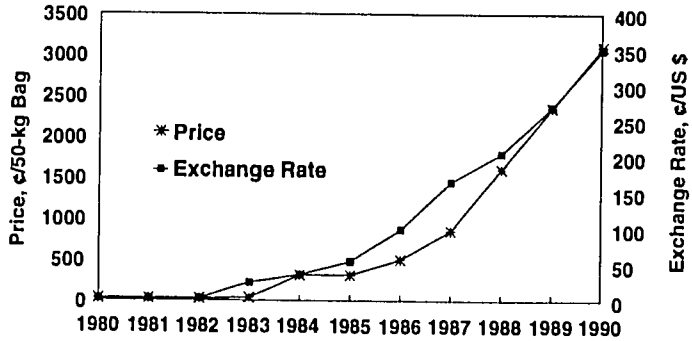
After 1988, foreign exchange was available to private dealers for importing fertilizers. However, because private importers were not allowed to import fertilizers until 1991, such availability of foreign exchange had no effective impact on fertilizer imports.

Thus during the 1970s and the early to mid-1980s, inadequate and untimely availability of foreign exchange was a constraint on fertilizer supply and use.

6.2.2 Exchange Rate Policy–Ghana's exchange rate policy changed drastically during the ERP period (1984-90). Before 1984, Ghana followed a policy of fixed exchange rate system. As a result, the exchange rate remained generally stable during the 1970-84 period, although the currency was devalued in 1971 and 1978. However, such devaluation had small impact on fertilizer prices.

After 1984, Ghana's exchange rate was adjusted frequently and allowed to depreciate considerably to reach a market-determined rate. As a result, the exchange rate changed from ¢2.8/US $ in 1983 to ¢350/US $ in 1990.

The depreciation of the exchange rate had two effects on the fertilizer sector operations. First, it increased the domestic cost of imported fertilizers. Hence, fertilizer prices paid by farmers increased rapidly (Figure 6.1).



Source: Ministry of Agriculture and Ministry of Finance and Economic Planning, Accra, Ghana.

Figure 6.1. Fertilizer Prices and Exchange Rate in Ghana, 1980-90.

Second, during the 1984-90 period, the exchange rate was depreciating rapidly. Sometimes it depreciated at more than 30%/month. Because procurement of fertilizers usually takes 2-3 months, such depreciation in exchange rate introduced high risk and uncertainty in fertilizer imports. Consequently, private importers in 1991 were asking for some kind of foreign exchange rate guarantee for importing fertilizers. Such guarantee was asked for compensating the risk incurred in importing fertilizer.

6.2.3 Import Controls–Ghana does not have any production facilities and thus does not have a policy of controls or tariffs on import of fertilizers. Currently, no tariffs are levied on fertilizer imports.

Thus Ghana's macroeconomic policy played an important role in constraining fertilizer supplies during the 1970-90 period. Only two of the three components had any impact. However, the roles of these two components changed during the 1970s and the 1980s. During the 1970s, allocation of foreign exchange was a main constraint. The exchange rate policy had little impact on fertilizer imports because Ghana's exchange rate remained stable during this period. During the 1980s, Ghana's exchange rate depreciated rapidly and therefore affected the domestic prices of imported fertilizers. Increased domestic prices reduced the relative profitability of fertilizer use. Furthermore, the exchange rate increased farmer's credit requirements and introduced risk and uncertainty for fertilizer imports by private dealers. Availability of foreign exchange also remained a constraint during the early and mid-1980s.

Macroeconomic policy affected the supply side in the 1970s and the demand side in the 1980s. In both cases, it constrained Ghana's capability to realize the full agroeconomic potential of fertilizer use.

6.3 Pricing and Subsidy Policy

6.3.1 Pricing Policy–Because the MOA had full responsibility for fertilizer procurement and distribution until 1988, it also followed a policy of pan-territorial pricing of fertilizer products. As a result, fertilizer prices were uniform throughout the country.

The countrywide uniform price was derived in two steps. In step one, for each product, total cost of imports (c. & f.), port handling and bank charges, and distribution costs including dealer margins were estimated. This provided a basis for deriving actual cost of fertilizers. In step two, a fixed percentage of subsidy was determined. Thereafter, the actual cost was adjusted to reflect subsidy rate. Until 1990, when subsidy was reduced to zero, subsidy rate varied between 65% and 15%.

The fertilizer pricing policy had three implicit goals. First, to promote growth in fertilizer use, fertilizer prices were kept low and stable. This helped in keeping fertilizer use profitable for farmers. Second, farmers located in the upper regions and remote areas did not have to pay higher distribution and transportation costs. Hence, the MOA ensured uniform prices throughout the country. Third, to achieve the first two goals, fertilizer use was subsidized. Although the initial objective of the subsidy policy was to pay only for transportation costs (NFDC, 1975), subsidy also covered a significant proportion of import costs and related charges.

A major change took place in the pricing and subsidy policy under the ERP in 1984. Along with the liberalization of exchange rate and foreign trade, the Government of Ghana also decided to phase out all subsidies including subsidies on fertilizers. This step was taken in response to World Bank and IMF conditionality as well as to reduce the increasing fiscal burden of subsidies. This change in policy as well as the depreciation of the exchange rate led to rapid increases in fertilizer prices. It was indicated above that such rapid increases in fertilizer prices reduced significantly the relative profitability of fertilizer use and led to a significant decrease in fertilizer use in the 1980s (Figure 6.2).

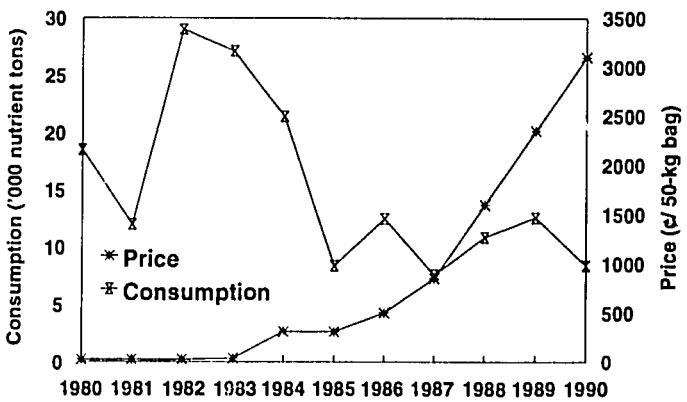


Figure 6.2. Fertilizer Consumption and Price in Ghana, 1980-90.

Although nominal fertilizer subsidy was reduced to zero in 1990, the policy of uniform pricing was still in effect. IFDC teams visited Ghana in May and September of 1991. Both teams recommended that fertilizer prices be liberalized at the retail level, but the Government of Ghana has been reluctant to make that move. Because this policy change is crucial for making market and enterprise reforms successful, this issue is analyzed in greater detail below.

Not only are changes in fertilizer prices important but also changes in crop prices. In the area of crop prices, two points should be noted. First, before 1988, the GFDC had the responsibility for procuring and distributing grains through public sector shops. It also had the responsibility for implementing the guaranteed minimum price scheme. However, because of financial and logistical constraints,

GFDC never played a major role in grain marketing in Ghana. It procured only 5%-6% of total grain marketed in the country. Also, because of financial difficulties, it could not implement the guaranteed minimum price scheme. Second, after 1988, GFDC ceased to operate the guaranteed minimum price scheme and was allowed to operate as a commercial entity.

This change in policy will have serious implications for fertilizer use. The experience of many developing countries in Asia and Latin America suggests that unless farmers are assured of minimum return on their investment in new technologies they will be hesitant to adopt such technologies. Fluctuations in prices resulting from the cobweb type of farmer response to changes in crop prices will be accentuated by new technologies. This issue needs further research and exploration.

Given these policy changes in the area of crop and fertilizer prices, one may genuinely ask whether the existing pricing policy environment is conducive to fertilizer use.

It was indicated in Chapter 4 that real cost of fertilizers increased over 12-fold between 1970 and 1980–from 0.3 kg of maize to 3.5 kg of maize/kg of nitrogen (through ammonium sulfate). This increase in real cost was also associated with a steep fall in fertilizer use during this period.

6.3.2 Economics of Fertilizer Use–To assess the profitability of fertilizer use in the 1980s, we have to evaluate the economics of fertilizer use, which requires information about crop response and crop and fertilizer prices.

The trends in crop and fertilizer prices have already been analyzed in Chapter 4, and crop response to fertilizer use is briefly analyzed here. Henao et al. (1992) have estimated and analyzed fertilizer response functions for several crops in different agroecological regions. Table 6.1 summarizes the output elasticity of fertilizer use by different crops. These estimates suggest that many crops will respond to fertilizer use positively, although the response to different nutrients varies among different crops. For example, the response of maize yield to nitrogen use is higher than it is to potash use. Likewise, legumes respond better to phosphate use than to N use because the legumes have the capability to fix nitrogen directly from the atmosphere.

Table 6.1. Ghana: Fertilizer Elasticity of Crop Yields

Yield by Crop	N	P_2O_5	K_2O	NPK
Cassava	0.15	0.03	0.10	0.23
Cotton	0.13	0.06	0.01	0.18
Cowpea	0.04	0.22	0 04	0.24
Groundnut	0.03	0.18	0.04	0.20
Maize	0.16	0.05	0.02	0.18
Lowland rice	0.17	0.12	0.02	0.26
Upland rice	0.18	0.10	0.005	0.23
Sorghum	0.09	0.10	0.005	0.18
Soybean	0.03	0.10	NE	0.16

NE = Not estimated.

Source: Henao et al. (1992).

In order to estimate profitability of fertilizer use, we need estimates of marginal productivity of fertilizer use. The estimated response functions are presented in Table 6.2. For the sake of brevity, and from a policy point of view, we are analyzing only response to total NPK ($N+P_2O_5+K_2O$) here. In devising crop-specific recommendations in different regions, a detailed analysis of crops and regions should be done.

In Table 6.3, the marginal productivity of fertilizer use is estimated at three levels of nutrient use, namely 35, 70, and 100 kg of nutrients. The first two levels correspond closely to the existing fertilizer recommendations made by the Extension Service of Ghana. The first level consists of 1 bag (50 kg) each of AS and NPK (15-15-15) and the second of 2 bags each of AS and NPK (15-15-15).

Before we use these coefficients in estimating the profitability of fertilizer use, it should be noted that these data are for normal-rainfall years and are based on the experiments conducted by researchers on the farmers' fields as well as on experimental stations. Hence, they reveal the outcome in a state of perfect knowledge and no uncertainty. However, many farmers do not have full knowledge about a costly input like fertilizers, nor do they have normal rainfall in all years. During 1985-90, Ghana experienced drought conditions twice–1986 and 1990. Rainfall uncertainty is much higher in the Upper and Northern regions than in the Southern regions. Hence, an allowance has to be made for these conditions. Both of these factors suggest that the results derived from these coefficients should be taken with caution. The uncertainty resulting from fluctuations in crop prices must also be taken into account when deriving conclusions from these data.

The profitability of fertilizer use at the three levels of nutrient use and the prevailing crop and fertilizer prices in 1989 is summarized in Table 6.4. It is clear that the prevailing pricing environment was not unfavorable for using fertilizers. However, if we make allowance for imperfect knowledge and uncertainty of rainfall and crop prices, the conclusion may change. Furthermore, the 1989 prices had 15% explicit subsidy and about 30% implicit subsidy. Additional data, analysis, and research are needed for assessing the impact of uncertainty on the profitability of fertilizer use in Ghana in a free market.

It should be pointed out that the conclusion based on marginal response coefficients is always different from the one based on average response coefficients used in

Table 6.2. Ghana: Fertilizer Response Functions, All Crops

Dependent Variable: Yield by Crop	Independent Variables				
	Intercept	NPK	NPK^2	S	R^2
Cassava	6,197.25	101.20	-0.11	104	0.86
	(8.72)	(11.76)	(-4.23)		
Cotton	678.93	7.65	-0.02	132	0.42
	(9.44)	(6.28)	(-3.90)		
Cowpea	323.02	8.78	-0.02	60	0.52
	(3.73)	(4.33)	(-2.05)		
Groundnut	428.13	6.60	-0.01	72	0.77
	(9.36)	(6.96)	(-2.73)		
Maize	1,282.50	25.26	-0.06	776	0.39
	(12.46)	(20.36)	(-16.06)		
Lowland rice	937.16	27.57	-0.07	25	0.77
	(3.94)	(5.99)	(-3.51)		
Upland rice	759.72	19.67	-0.04	31	0.48
	(1.77)	(2.37)	(-0.94)		
Sorghum	851.49	21.82	-0.09	42	0.31
	(3.30)	(3.99)	(-3.49)		
Soybean	1,003.85	20.99	-0.14	36	0.16
	(3.73)	(1.84)	(-1.27)		

S = Sample size.

Note: Figures in parentheses are t-statistics.

Source: Henao et al. (1992).

Table 6.3. Ghana: Marginal Physical Productivity of Fertilizer Use at Different Levels

Crop	Fertilizer Application Rates (kg nutrient/ha)		
	35	70	100
	(kg crop output/kg nutrient)		
Maize	21.1	16.9	13.3
Lowland rice	22.7	17.8	13.6
Upland rice	16.9	14.1	11.7
Sorghum	15.5	9.2	3.8
Cowpea	7.4	6.0	4.8
Soybean	11.2	1.4	-7.0
Groundnut	5.9	5.2	4.6
Cotton	6.3	4.9	3.7

Source: Derived from data in Henao et al. (1992).

Table 6.4. Ghana: Marginal Profitability of Fertilizer Use, 1989[a]

Crop	Fertilizer Application Rates (kg nutrient/ha)		
	35	70	100
	(¢/kg nutrient)		
Maize	885	679	503
Sorghum	1,091	587	155
Lowland rice	3,982	3,091	2,326
Groundnut	1,007	870	753
Cotton	2,245	1,713	1,257

a. The following crop prices (per kilogram of crop output) are used in calculating marginal profitability of fertilizer use: maize (¢49), rice (¢182), sorghum (¢80), groundnut (¢196), and cotton (¢380).

NPK price was ¢149/kg of nutrient.

the calculation of value-cost ratios (VCR). Because the average response is always higher than the marginal response, the VCR approach overestimates the profitability of fertilizer use and may lead to undesirable policy recommendations.

6.3.3 Subsidy Policy–Until 1990, fertilizers were subsidized. The rate of subsidy decreased from 65% in 1980 to 15% in 1989. This change in policy was a result of both donor conditionality and increasing fiscal burdens. It is the fiscal implications of the subsidy policy that are analyzed below.

With increase in fertilizer prices during the 1980s, the fertilizer subsidy bill also increased. The budget allocations for fertilizer subsidy increased from ¢31.6 million in 1980 to ¢531.5 million in 1988 (Table 6.5). These allocations

Table 6.5. Fertilizer Subsidies, 1980-90

Year	Fertilizer Subsidy	Fertilizer Subsidies as a Share of Agricultural Budget	
		Total	Developmental
	(million ¢)	(%)	
1980	31.6	3.4	NA
1982	21.5	2.2	NA
1984	70.0	5.3	18.2
1986	269.2	8.4	25.0
1988	531.5	10.6	32.8
1990	0	0	0

NA = Not available.

Source: Calculated from data on fertilizer prices, use, and subsidy rate. Data on agricutural budget are from *Quarterly Digest of Statistics* (various issues).

accounted for 5%-11% of the total agriculture budget and 18%-33% of the developmental budget for agriculture for 1984-88. Because a high proportion of the funds for the agricultural sector were consumed by fertilizer subsidies, very little was left for other developmental activity. However, it should be mentioned that, during the 1984-90 period, agriculture received less than 5% of the national budget (Table 6.6). The elimination of fertilizer subsidy thus helped the general macroeconomic situation by reducing budget deficits and creating budget surpluses in the late 1980s. Whether the funds released from the removal of subsidies were used for other agricultural activities like irrigation, research, extension, and rural road construction should be researched. The fiscal implications of pricing policy require a critical assessment.

However, these fiscal benefits must be compared with the foregone benefits resulting from decreased fertilizer use. A decrease of 20,000 nutrient tons in fertilizer use per year and the resulting crop output are the foregone benefits.

Table 6.6. Ghana: National and Agricultural Sector Budget, 1975-90

Year	National	Agricultural	Ratio[a]
	(million ¢)	(million ¢)	(%)
1975	1,162	76	6.5
1976	1,945	172	8.8
1977	3,017	427	14.2
1978	4,095	487	11.9
1979	4,672	571	12.2
1980	7,658	942	12.3
1981	8,842	969	11.0
1982	8,846	963	11.0
1983	14,756	1,536	10.4
1984	26,694	1,320	4.5
1985	45,764	1,940	4.2
1986	70,660	3,200	4.5
1987	99,135	4,696	4.7
1988	135,885	5,003	3.7
1989	186,843	9,142	4.8
1990	247,097	10,438	4.2

a. Ratio of agricultural budget to national budget. Note: From 1975 through 1982, data refer to split years, 1974/75 through 1981/82.

Source: *Quarterly Digest of Statistics* (various issues) and ISSER.

Assuming that each ton of nutrient added an average 10 tons of cereals, the crop output foregone is 200,000 tpy–an amount greater than the total cereal deficit of 1988. A careful cost-benefit analysis of this policy change is needed to assess its impact on Ghana's agriculture.

6.4 Organizational Policy

During the 1970-90 period, Ghana's policy on organizations involved in fertilizer procurement, marketing, and distribution evolved in three phases.

Phase One consists of the 1970-81 period. During this phase, the MOA had the full responsibility for importing and distributing fertilizers. The MOA received the fertilizers at the port and arranged their transportation to national, regional, and district warehouses. Fertilizers were distributed to farmers by the MOA staff from these and subdistrict warehouses.

In Phase Two, in the early 1980s, the MOA shifted a part of its responsibility for distribution to the Farmers Services Companies (FASCOMs) created under the World Bank-funded Agricultural Development Projects. Two FASCOMs were created, one serving the farmers in the Volta Region and the other serving the farmers in the Northern and Upper Regions. Although the Government of Ghana had a share in the ownership and management of these companies, they were created to operate as autonomous organizations. For several reasons, their operations remained subsidized. However, these companies were able to develop retail outlets in the rural areas. In the remaining regions,

the MOA continued to distribute fertilizers through its staff at the warehouses and depots.

Phase Three consists of the initiation of the privatization program. As a part of the ERP and the Structural Adjustment Program, the Government decided to phase out its direct involvement in fertilizer marketing and distribution. On the World Bank's request, IFDC conducted a study and developed a three-stage privatization scheme for fertilizer import, marketing, and distribution (IFDC, 1986). As a result, the Government of Ghana introduced a privatization scheme in 1988 on a pilot basis in the Volta and Brong-Ahafo regions. This was extended to other regions in 1989 at the retail levels and in 1990 at the wholesale level. In 1991, the Government allowed the private dealers to import fertilizers in Ghana. Thus, until 1991, fertilizer import remained the monopoly of the MOA.

Initial response of the private sector was rather discouraging. Not many dealers came forward to take over the stocks and depots from the MOA. To make the privatization program successful, the Government of Ghana requested IFDC to assess the situation and make recommendations for making privatization of fertilizer import, marketing, and distribution successful. The IFDC team spent about 6 weeks in Ghana and recommended a 5-year scheme to develop skills, networks, and institutional arrangements for strengthening privatization efforts (IFDC, 1991).

From the policy environment point of view, it should be stressed that the Government of Ghana initiated the privatization program when fertilizer prices were rising rapidly, exchange rate was depreciating drastically, and the size of the fertilizer market was shrinking. It is obvious that under such uncertain circumstances the response of the private sector was slow. Furthermore, the MOA followed the policy of price control and pan-territorial pricing. Under free market conditions, private dealers must have freedom to price the product. The dominant position of FASCOMs in the heavy-fertilizer-consuming regions was also cited as a constraint on private sector involvement. This is because the operations of FASCOMs remain highly subsidized.

Without further research, it is difficult to say whether the privatization policy was socially justifiable and optimal. However, the timing of the policy was definitely not opportune. A review of privatization operations undertaken by the World Bank revealed that macroeconomic stability is crucial for privatization to succeed (Shirley and Nellis, 1991). Also, a reasonable degree of financial and price stability is needed. Furthermore, private dealers will move to those areas where the market is growing. In Ghana, the fertilizer market was shrinking. With the small size of the market, the danger of private sector monopoly cannot be ruled out. The Government should take adequate precautions to avoid monopolization of fertilizer imports by one or two dealers.

6.5 Supply Policy

Ghana has no raw materials for fertilizer production and thus has wisely depended on fertilizer imports. The main objectives of the supply policy are to provide fertilizers in the right quantity and at the right time, and Ghana's supply policy can be considered less successful in this area. Fertilizers arrived late, and the types were unsuitable. This was mostly a result of foreign exchange shortages and arrangements for allocation of foreign exchange.

At the microlevel, the transportation of fertilizers was adequate and prompt, and fertilizers were available in good condition at the district level. But at the village level, the performance was inadequate. In many districts, farmers had to travel 20 miles to buy fertilizers. Such distance naturally discouraged farmers from using fertilizers. It is hoped that private dealers will move to villages and will help in promoting fertilizers in remote areas.

6.6 Credit Policy

There is no specific credit policy for fertilizer users and dealers in Ghana. Credit for agricultural operation was subsidized until 1988. However, under the ERP, this policy has been changing. Now there is no subsidy for agricultural operations.

During the 1980s, interest rates charged for agricultural activities increased rapidly (Table 6.7). However, because the inflation rate was also high, the real rate did not change much.

Increasing fertilizer prices have increased the need for credit for both fertilizer dealers and farmers. In 1980, a farmer needed ¢12 to buy a bag of ammonium sulfate, whereas in 1990, she needed ¢3,100/bag–a 258-fold increase in credit needed to buy fertilizer. No wonder many farmers in a recent survey identified credit as a major constraint on

Table 6.7. Ghana: Interest Rate for Agriculture, 1970-90[a]

Year	Interest Rate
	(%)
1970	7.5
1975	6.0
1980	9.0
1985	18.5
1990	26.0

a. Interest rate charged by the Agricultural Development Bank and Commercial Banks for agricultural operations.

Source: The Bank of Ghana, Accra.

the use of fertilizers. Because many women farmers do not have collateral, they have difficulty in getting the necessary loans. One way to solve this problem is to look into the possibility of credit-in-kind. The Global 2000 experience suggests that farmers are willing to use fertilizers if they are sold on credit, but the farmers have difficulty in returning the borrowed credit. Because of the high default rates in 1990, Global 2000 is withdrawing from credit distribution. Therefore, there is a need to develop increased crop output and input markets that will help in trading fertilizers for crop output.

Many banks in Ghana have little experience in providing credit to fertilizer dealers using fertilizers as collateral. On the other hand, because many small dealers are new to this business and have inadequate property for collateral, a sound credit system should be developed. Initially, the Government of Ghana can take the lead in providing some guarantee for such loans.

Chapter 7
Summary and Conclusions

Ghana's population increased from 6.7 million in 1960 to 14.1 million in 1990 and is projected to reach 18.7-19.5 million in the year 2000. This growth in population along with expected increase in income and urbanization will increase demand for food, fiber, and fuel.

Ghana's agricultural economy is passing through a developmental disequilibrium. With growth in population and income, the traditional system of shifting cultivation is inadequate to meet the growing demand for food, fiber, and fuel. Hence, a shift to intensive cultivation based on new crop technologies is required. Such technological transformation will need, among other things, increased use of organic and inorganic fertilizers.

Fertilizer use levels in Ghana are rather low. In 1990, Ghana used about 11,600 tons of nutrients. This level of nutrient use replenished only one-seventh of the nutrients removed by crops. In terms of per hectare fertilizer use, Ghana used 5 kg of plant nutrient compared with 12 kg in Nigeria, 48 kg in Kenya, and 110 kg in Indonesia.

During the 1970s and early 1980s, Ghana experienced economic stagnation and decline. To reverse the economic decline, Ghana introduced a bold Economic Recovery Program in 1984. Under this program, several policy and institutional changes were introduced. Major policy reforms included liberalization of trade and exchange rate policy, elimination of budget deficits, phasing out of subsidies, and privatization of state-owned enterprises. As a result of these changes, Ghana's national income increased by 5.3% per annum during the 1984-90 period. Crop production also increased significantly, although the annual growth of the agricultural GDP was lower than that of overall GDP during this period.

In spite of growth in crop production, Ghana experienced deficits in its food budget and depended on food imports. The Ministry of Agriculture estimated that, unless steps are taken to increase food production, Ghana's grain deficit will increase to 750,000 tons in the year 2000. Also, Ghana's population satisfied only 76% of its daily nutritional requirements; to remove hunger and malnutrition, Ghana's agricultural output must increase.

Ghana's agricultural sector plays an important role in the national economy. It provides about 53% of GDP, 60% of employment, and 75% of merchandise exports. Hence, growth in agricultural output is needed for both economic development and social well-being.

Because increased fertilizer use will remain critical to achieve over 4.0% annual growth in crop output, this study assessed the role of the policy environment in accelerating growth in fertilizer use.

The study focused on seven policies, namely, macroeconomic, pricing and subsidy, supply, credit, organizational, research and extension, and environmental policies. Only selected components of each policy having direct and indirect impact on the fertilizer sector operations were analyzed. The study covered the 1970-90 period.

During the period of the study, the macroeconomic policy played an important role in constraining growth in fertilizer use. During the 1970-88 period, availability of foreign exchange was a major constraint. Consequently, Ghana depended on fertilizer aid to meet its domestic fertilizer requirement. This resulted in a supply-side constraint on fertilizer use. After 1988, excessive stocks were available in the country.

Exchange rate liberalization led to increases in the domestic price of fertilizers. During the 1980-90 period, nominal fertilizer prices increased by over 25,000%. Although a part of this increase in fertilizer prices was compensated by increase in crop prices, the real price of nutrients increased severalfold from 0.3 kg maize/kg N in 1980 to 3.5 kg maize/kg N in 1990. This reduction in the relative profitability of fertilizer use had a negative impact on fertilizer use in Ghana.

The policy of removing fertilizer subsidies also led to increased fertilizer prices. Under the ERP, fertilizer subsidy was reduced from 65% in 1980 to 0% in 1990. The removal of fertilizer subsidies contributed to both reduced fiscal deficits and decreased fertilizer use.

Because both policies, namely, exchange rate liberalization and subsidy removal, were implemented simultaneously, it was not possible to separate their impact on fertilizer use. However, the joint impact of these policies was that fertilizer use decreased from about 30,000 nutrient tons in 1980-82 to about 11,000 nutrient tons in 1988-90.

During the 1970-88 period, the Ministry of Agriculture had the sole responsibility for import and marketing and distribution of fertilizers. In 1988, the private sector was allowed to distribute fertilizers in two regions–Volta and Brong Ahafo. By 1990, private dealers were free to sell fertilizers anywhere in the country. Fertilizer imports were liberalized by 1991. However, the privatization program did not achieve the desired success. The macroeconomic and price instability discouraged the private dealers from entering this market. It is clear from Ghana's experience that macroeconomic and pricing stability is necessary for

the success of privatization programs. Lack of credit for farmers and fertilizer dealers also contributed to this result.

Ghana's credit policy also changed during the 1980s. Credit for agricultural operations remained subsidized until 1987. After 1987, the interest rate charged to the borrowers in the agricultural sector was no different from that charged to other borrowers. This led to decreased institutional credit for the agricultural sector. Consequently, the share of agriculture in total institutional lending decreased from 42% in 1982 to 13% in 1989.

At a time when a severalfold increase in fertilizer prices led to increased credit requirements for both farmers and fertilizer dealers, interest rates for farm credit were increased. Consequently, many farmers and dealers were unable to borrow funds to buy fertilizers or benefit from the privatization program. Inadequate collateral also contributed to this problem.

Because Ghana does not have facilities for domestic manufacture of fertilizers, it depends on imports. Because of foreign exchange shortages and institutional arrangements, supply policy remained a major constraint on fertilizer use in Ghana. Private dealers should have been allowed to market and distribute fertilizers during the 1970s and early 1980s when the fertilizer market was growing. Private dealers were allowed at a time when the fertilizer market was shrinking rapidly.

From the environmental point of view, Ghana has not developed a policy conducive to the prevention of soil degradation and chemical pollution. In the future, relatively greater emphasis should be laid on developing and implementing this policy. Ghana also lacks an integrated research and extension policy dealing with fertilizer use. The diversity of agroclimatic regions requires detailed and site-specific fertilizer recommendations. Currently, little diversity is provided in fertilizer recommendations.

Regional distribution of fertilizer use and supply suggests that measures should be instituted to prevent widening regional disparities between the south and the north. Adequate development of physical infrastructures to reduce transportation cost should receive priority in the future developmental work. Meanwhile, a safety net should be provided to the farmers in the north so that the cost of fertilizer use is not prohibitively high.

Ghana's experience of the 1980s suggests that if the growth in fertilizer use is needed to achieve socioeconomic goals like food security, environmental protection, foreign exchange savings, and balanced regional development, then the policy reform program should be introduced in phases. Macroeconomic and price stability should be ensured for privatization.

The simultaneous introduction of exchange rate liberalization and subsidy removal programs does not promote growth in fertilizer use nor does it encourage private sector participation. Proper sequencing and phasing should be developed for each policy and, if needed, some safety nets should be provided to counteract the undesirable impact of certain policies.

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